
This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

GoogleTM books

<https://books.google.com>



3-1 PG

CONDENSED CATALOGUES OF MECHANICAL EQUIPMENT

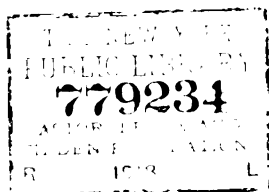
WITH

MECHANICAL EQUIPMENT DIRECTORY

**Standardization Work of the Society,
List of Transactions Papers, and
Engineering Data are included**

**EIGHTH ANNUAL VOLUME
OCTOBER, 1918**

**Published by
The American Society of Mechanical Engineers
29 West 39th Street
New York**



CONTENTS

PREFACE

CATALOGUE SECTION

	PAGE
Index to Firms Represented.....	6, 7, 8, 9, 10, 11, 12
PART I, Power Plant Equipment.....	13
PART II, Power Transmission Machinery, Elevating and Conveying Machinery, Hoisting and Transporting Machinery.....	185
PART III, Metals. Alloys and Other Materials.....	283
PART IV, Metal Working Machinery, Machine Tools and Accessories, Shop Equipment.....	307
PART V, Compressors, Fans, Blowers, Pumping and Hydraulic Machinery, Crushing and Drying Machinery, Engineering Miscellaneous.....	425
PART VI, Testing, Measuring and Recording Apparatus.....	509

DATA SECTION

PART I, A. S. M. E. Standards.....	541
PART II, Engineering Data.....	575
PART III, List of Transactions Papers.....	589

DIRECTORY SECTION

PART I, Mechanical Equipment Directory.....	621
PART II, Consulting Engineers' Directory.....	799

PREFACE

IT is with much pleasure that the Society records a further considerable gain in size and comprehensiveness in this the Eighth Annual (1918) Volume of A. S. M. E. Condensed Catalogues of Mechanical Equipment.

Four hundred and fifteen firms, including a majority of the leading manufacturers in their respective lines, are represented by publication of catalogue data in this edition, constituting a gain of nearly one hundred firms as compared with the 1917 volume. The number of pages in the Catalogue Section is five hundred and fifteen, as against four hundred and nine in 1917, while the total number of pages in the entire volume has been increased by approximately thirty per cent.

The General Mechanical Equipment Directory, in which all eligible manufacturers are entitled to listing of their products free of charge within reasonable limits and irrespective of the use of space, and the Consulting Engineers' Directory compiled from the membership of the Society, have also been extended and improved in this volume, and it is believed that these reference features will prove of even greater value than heretofore to the members of the Society and to the profession at large. Attention is also invited to the enlargement of the Engineering Data Section, in which a complete list of Transactions Papers has been added to the data selected from The Journal and Transactions for the past year, and the summary covering Standards relating to equipment and processes as formulated by committees of the Society.

It is most gratifying to observe the improvement which has also taken place in the character of the material published in the Catalogue Section. It is evident that manufacturers are coming to realize more and more clearly the requirements of the engineer for detailed information and specific data in a reference work of this character, and it is believed that all concerned are to be congratulated on the great progress which has been made in this respect in this edition of the Condensed Catalogues. It is confidently expected that future editions will show constant progress along these lines, to the end that the engineer may rely upon the Condensed Catalogues to fulfil all the requirements of a primary source of reference concerning the products of the various manufacturers in the field.

The publication of this annual reference work for the buyer and user of mechanical equipment is essentially a coöperative undertaking in which the Society acts as a logical agent rather than as a publisher in the usual sense of the term. Acknowledgment is due to the many firms whose coöperation in the use of space has made it possible for the Society to furnish this convenient and useful reference work to the mechanical engineering profession, with the aim of affording a closer and more efficient point of contact between the user and the maker of mechanical equipment.



NOTE.—All data presented have been edited with a view to the elimination of advertising claims or exaggerated statements and every effort made to restrict the Condensed Catalogues to firms of good standing only. Publication of catalogue data does not constitute in any sense an endorsement by the Society of the firms or products thus represented.

Extract from Constitution: C 55. The Society shall not be responsible for statements or opinions advanced in papers or in discussions.

INDEX TO CONDENSED CATALOGUES

A

	PAGE
Acme Machine Tool Co., Cincinnati, O.	319
Akron Metallic Gasket Co., 152 N. Union St., Akron, O.	177
Albany Lubricating Co., 708-10 Washington St., New York	173
Aldrich Pump Co., Allentown, Pa.	438
Allan & Son, A. Harrison, N. J.	286, 287
*Alliance Machine Co., Alliance, O.	264
*Allis-Chalmers Mfg. Co., Milwaukee, Wis.	15
Almy Water Tube Boiler Co., Providence, R. I.	34
Aluminum Co. of America, Pittsburgh, Pa.	294
American Blower Co., Detroit, Mich.	434, 435
American Brass Co., Waterbury, Conn.	295
*American Bronze Corp'n, Berwyn, Pa.	288, 289
*American District Steam Co., North Tonawanda, N. Y.	140
† American Injector Co., Detroit, Mich.	151
American Kron Scale Co., 430 E. 53rd St., New York	513
† American Metal Hose Co., Waterbury, Conn.	184
*American Metal Treatment Co., Elizabeth, N. J.	418
† American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa.	200
American Screw Co., Providence, R. I.	400, 401
American Steam Conveyor Corp'n, 326 W. Madison St., Chicago, Ill.	101
† American Steam Gauge & Valve Mfg. Co., Boston, Mass.	142, 143
American Tool & Machine Co., Boston, Mass.	490
† American Vulcanized Fibre Co., Wilmington, Del.	296
Anderson Foundry & Machine Works, Anderson, Ind.	27
Anthony Co., 138 West Ave., Long Island City, N. Y.	410
*Ashton Valve Co., 161 First St., Cambridge, Boston, Mass.	526
Atkins & Co., Inc., E. C., Indianapolis, Ind.	385
*Atlas Ball Co., Glenwood Ave. at 4th St., Philadelphia, Pa.	233
Atlas Press Co., 310 No. Park St., Kalamazoo, Mich.	318
Auburn Ball Bearing Co., 22 Elizabeth St., Rochester, N. Y.	215
Automatic Furnace Co., Dayton, O.	78
Automatic Refrigerating Co., Hartford, Conn.	477

B

*Babcock & Wilcox Co., 85 Liberty St., New York	36, 37, 38, 39
Babson-Dow Mfg. Co., 60 Fulda St., Boston, Mass.	399
Badger & Sons Co., E. B., Boston, Mass.	159
*Bailey Meter Co., 141 Milk St., Boston, Mass.	519
*Baldwin Chain & Mfg. Co., Worcester, Mass.	198
*Ball Engine Co., Erie, Pa.	16
Bartlett & Snow Co., C. O., Cleveland, O.	249
Bass Foundry & Machine Co., Fort Wayne, Ind.	35
Bayonne Casting Co., Bayonne, N. J.	291
*Beaudry & Co., Inc., 141 Milk St., Boston, Mass.	315
Becker Milling Machine Co., Hyde Park, Boston, Mass.	352
Benjamin Electric Mfg. Co., 122 S. Sangamon St., Chicago, Ill.	504
*Best, Inc., W. N., 11 Broadway, New York	411
Biddle, James G., 1211-1213 Arch St., Philadelphia, Pa.	539
*Bigelow Co., 76 River St., New Haven, Conn.	40
*Bilton Machine Tool Co., Bridgeport, Conn.	353
Blake & Johnson Co., Waterbury, Conn.	482
Blanchard Machine Co., Cambridge, Mass.	358
Blaw-Knox Co., Pittsburgh, Pa.	489
Bliss Co., E. W., 19 Adams St., Brooklyn, N. Y.	310, 311
Bonnot Co., Canton, O.	464
Bossert Corp'n, Utica, N. Y.	304
Bradley & Son, Inc., C. C., Syracuse, N. Y.	316
Braemer Air Conditioning Corp'n, Lafayette Bldg., Philadelphia, Pa.	470
Bristol Co., Waterbury, Conn.	530
*Brown Co., A. & F., 79 Barclay St., New York City	187
*Brown Hoisting Machinery Co., Cleveland, O.	265
Brown Instrument Co., Philadelphia, Pa.	531
Brown Portable Conveying Machinery Co., Chicago, Ill.	262
Buckeye Iron & Brass Works, Dayton, O.	481
Budd Grate Co., 2013 E. Letterly St., Philadelphia, Pa.	86
*Builders Iron Foundry, Providence, R. I.	520

Advertisements of firms marked * appear in The Journal, A. S. M. E.

INDEX TO CONDENSED CATALOGUES

	PAGE
Bullard Machine Tool Co., Bridgeport, Conn.....	337
Bunting Brass & Bronze Co., 729 Spencer St., Toledo, O.....	285
Burroughs Co., Charles, Newark, N. J.....	454
Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo.....	23
Byers Co., A. M., Pittsburgh, Pa.....	154

C

*Caldwell & Son Co., H. W., 17th St. & Western Ave., Chicago, Ill.....	250
Caldwell Co., Inc., W. E., 340 E. Branders St., Louisville, Ky.....	201
Cameron Steam Pump Works, A. S., 11 Broadway, New York.....	439
Carborundum Co., Niagara Falls, N. Y.....	389
Carey Co., Philip, Cincinnati, O.....	164, 165
Carrier Engineering Corp'n, 39 Cortlandt St., New York.....	471
*Casey-Hedges Co., Chattanooga, Tenn.....	42, 43
Celite Products Co., 11 Broadway, New York.....	98
*Central Foundry Co., 90 West St., New York.....	155
*Chain Belt Co., 735 Park St., Milwaukee, Wis.....	118, 119
Challenge Machine Co., Inc., Philadelphia, Pa.....	388
Chalmers & Williams, Inc., 1450 Arnold St., Chicago Heights, Ill.....	465
Chambers Brothers Co., Philadelphia, Pa.....	480
Champion Rivet Co., Cleveland, O.....	408
Chicago Tile Arch Furnace Co., 321 W. Austin Ave., Chicago, Ill.....	96
Cincinnati Ball Crank Co., Cincinnati, O.....	398
Cincinnati Planer Co., Oakley, Cincinnati, O.....	338, 339
Cincinnati Screw Co., Twightwee, O. (Cincinnati Suburb).....	402
Cleveland Automatic Machine Co., Cleveland, O.....	333
Cleveland Twist Drill Co., Cleveland, O.....	378
*Clyde Iron Works, 29th Ave. W. & Michigan St., Duluth, Minn.....	268
Coburn Trolley Track Mfg. Co., Holyoke, Mass.....	276
Coburn Machine Tool Co., Franklin, Pa.....	340, 341
Cole Mfg. Co., R. D., Newnan, Ga.....	41
Columbus Bolt Works Co., Columbus, O.....	405
*Continental Fibre Co., Newark, Del.....	297
Conveying Weigher Co., 90 West St., New York.....	251
Coppus Engineering & Equipment Co., Worcester, Mass.....	76, 77
Corbin Screw Corp'n, New Britain, Conn.....	403
*Cramp & Sons Ship & Engine Bldg. Co., Wm. (I. P. Morris Dept.), Richmond & Norris Sts., Philadelphia, Pa.....	450, 451
*Crane Co., 836 So. Michigan Ave., Chicago, Ill.....	120, 121, 122, 123
Crane Packing Co., 9 S. Clinton St., Chicago, Ill.....	178
Crescent Belt Fastener Co., 381 Fourth Ave., New York.....	246, 247
Crosby Steam Gage & Valve Co., 40 Central St., Boston, Mass.....	527

D

D & W Fuse Co., Providence, R. I.....	393
Darling Pump & Mfg. Co., Ltd., Williamsport, Pa.....	124
D'Este Co., Julian, 26 Canal St., Boston, Mass.....	144
*De La Vergne Machine Co., 1123 E. 138th St., New York.....	28
De Laval Steam Turbine Co., Trenton, N. J.....	22
Deming Co., Salem, O.....	440
*Detrick Co., M. H., 549 W. Washington St., Chicago, Ill.....	97
Detroit Lubricator Co., Detroit, Mich.....	167
Detroit Oak Belting Co., Detroit, Mich.....	236
Detroit Stoker Co., Detroit, Mich.....	79
Diamond Expansion Bolt Co., 90 West St., Cor. Cedar, New York.....	409
*Diamond State Fibre Co., Bridgeport, Pa.....	298
Dill Machine Co., Inc., T. C., Philadelphia, Pa.....	345
Dillon Steam Boiler Works, D. M., Fitchburg, Mass.....	44, 45
Dodge Sales & Engineering Co., Mishawaka, Ind.....	102, 202, 203, 204, 205, 206
*Doehler Die-Casting Co., Brooklyn, N. Y.....	292
Dole Valve Co., 208 N. Wells St., Chicago, Ill.....	141
Durant Mfg. Co., Milwaukee, Wis.....	540

E

*Edge Moor Iron Co., Edge Moor, Del.....	46
Edwards Mfg. Co., 306-336 Eggleston Ave., Cincinnati, O.....	506
Ehret Magnesia Mfg. Co., Valley Forge, Pa.....	164, 165
Engelhard, Charles, 30 Church St., New York.....	532
Epping-Carpenter Pump Co., Pittsburgh, Pa.....	441

F

*Fafnir Bearing Co., New Britain, Conn.....	216
Falk Co., Milwaukee, Wis.....	188, 189

Advertisements of firms marked * appear in the Journal, A. S. M. E.

INDEX TO CONDENSED CATALOGUES

	PAGE
* Falls Clutch & Machinery Co., Cuyahoga Falls, O.....	207
* Farnham Mfg. Co., 31-39 Indiana St., Buffalo, N. Y.....	277
* Pawcus Machine Co., Pittsburgh, Pa.....	190, 191
* Fellows Gear Shaper Co., Springfield, Vt.....	349
* Flexible Steel Lacing Co., 522 S. Clinton St., Chicago, Ill.....	248
* Flory Mfg. Co., S., Bangor, Pa.....	269
* Flynn & Emrich Co., Baltimore, Md.....	85
* Ford Chain Block & Mfg. Co., Second & Diamond Sts., Philadelphia, Pa.....	278
* Ford Co., Thomas P., 407 Broome St., New York.....	125
* Foxboro Co., Inc., Foxboro, Mass.....	533
* France Packing Co., Tacony, Philadelphia, Pa.....	179
* Franklin Mfg. Co., Franklin, Pa.....	164, 165
* Frost Mfg. Co., 112 W. Adams St., Chicago, Ill.....	47, 462
* Fuller-Lehigh Co., Fullerton, Pa.....	92
* Fulton Iron Works Co., St. Louis, Mo.....	24

G

Galland-Henning Mfg. Co., 26th-27th Ave. & Layton Park, Milwaukee, Wis.....	455
* General Electric Co., Schenectady, N. Y.....	20, 21, 521
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.....	342
Glasgow Iron Co., 15th & Market Sts., Philadelphia, Pa.....	68
* Goetze Gasket & Packing Co., 22 Allen Ave., New Brunswick, N. J.....	180
* Goodrich Rubber Co., B. F. Akron, O.....	183, 242
Gooley & Edlund, Inc., Cortland, N. Y.....	354
Graton & Knight Mfg. Co., Worcester, Mass.....	237
Greaves-Klusman Tool Co., Cincinnati, O.....	320
* Green Engineering Co., 13 Kennedy Ave., East Chicago, Ill.....	80, 81
* Green Fuel Economizer Co., 90 West St., New York.....	73
* Greene, Tweed & Co., 109 Duane St., New York.....	168
* Greenfield Tap & Die Corp'n, Greenfield, Mass.....	374, 375
* Gurney Ball Bearing Co., Jamestown, N. Y.....	218, 219
* Gwilliam Co., 253 W. 58th St., New York.....	234, 235
Gwynn Engineering Co., 100-108 Liberty Ave., Pittsburgh, Pa.....	412

H

Hall Mfg. Co., Abington, Mass.....	379
Hammel Oil Burning Equipment Co., 409 Pine St., Providence, R. I.....	95
Harrison Safety Boiler Works, 3130 N. 17th St., Philadelphia, Pa.....	104, 105
Hastings Pavement Co., 25 Broad St., New York.....	507
Hays Corp'n., Jos. W., Michigan City, Ind.....	523
* Heine Safety Boiler Co., St. Louis, Mo.....	50
Hess-Bright Mfg. Co., Philadelphia, Pa.....	217
* Hill Clutch Co., Cleveland, O.....	208
Himoff Machine Co., 45-53 Mills St., Astoria, New York.....	350
Hobson, Russell B., New Brighton, N. Y.....	150
* Hodges Water Still Co., Inc., 1234 Callowhill St., Philadelphia, Pa.....	500
Hoggson & Pettis Mfg. Co., New Haven, Conn.....	394, 395, 396
Holmes & Bros., Robt., Danville, Ill.....	270
* Homestead Valve Mfg. Co., P. O. Box 1754, Pittsburgh, Pa.....	126
Hope Engineering & Supply Co., Mt. Vernon, O.....	32
Houston, Stanwood & Gamble Co., Cincinnati, O.....	48, 49, 321
* Hunt Co., Inc., C. W., West New Brighton, Staten Island, N. Y.....	252, 253
* Hunt Machine Co., Rodney, Orange, Mass.....	449
Huther Bros. Saw Mfg. Co., Rochester, N. Y.....	386
Hyatt Roller Bearing Co., Metropolitan Tower, New York.....	220, 221

I

Ideal Automatic Governor Co., 164 Emmet St., Newark, N. J.....	145
Industrial Works, Bay City, Mich.....	266, 267
Ingersoll-Rand Co., 11 Broadway, New York.....	428, 429
International Machine Tool Co., 1124 W. 21st St., Indianapolis, Ind.....	322, 323

J

Jacobson Engineering Co., Albany, N. Y.....	31
* James Mfg. Co., D. O., 1118-24 W. Monroe St., Chicago, Ill.....	192, 193
Jarvis Engineering Co., 261 Franklin St., Boston, Mass.....	502
* Jenkins Bros., 80 White St., New York.....	128, 129
* Johns-Manville Co., H. W., 296 Madison Ave., New York.....	162
Johnson Machine Co., Carlyle, Manchester, Conn.....	209
Jointless Fire Brick Co., 1879 Kingsbury St., Chicago, Ill.....	99
Jones Foundry & Machine Co., W. A., 4401 W. 12th St., Chicago, Ill.....	194
* Jones & Lamson Machine Co., Springfield, Vt.....	324, 325, 326, 327

*Advertisements of firms marked * appear in The Journal, A. S. M. E.*

INDEX TO CONDENSED CATALOGUES

K

PAGE

K-G Welding & Cutting Co., Inc., 556 W. 34th St., New York	419
Kearney & Trecker Co., Milwaukee, Wis.	356
Keasbey & Mattison Co., Ambler, Pa.	164, 165
Keeler Co., E., Williamsport, Pa.	51
Keller Mechanical Engraving Co., 68 Washington St., Brooklyn, N. Y.	369
Kelley & Jones Co., Greensburg, Pa.	130, 131
Kemp Smith Mfg. Co., Milwaukee, Wis.	355
Kenworthy, Inc., Charles F., Waterbury, Conn.	414, 415
Kieley & Mueller, Inc., 34 W. 13th St., New York	146
Koven & Brother, L. O., 154 Ogden Ave., Jersey City, N. J.	494
Krause, Arthur E., Mountain Lakes, N. J.	111
Kroeschell Bros. Co., 460 West Erie St., Chicago, Ill.	56

L

Ladd Co., George T., 1620 Farmers Bank Bldg., Pittsburgh, Pa.	52, 53
*Lammert & Mann Co., Wood & Walnut Sts., Chicago, Ill.	448
Lamson Co., 100 Boylston St., Boston, Mass.	254, 255
Landis Machine Co., Inc., Waynesboro, Pa.	372, 373
Landis Tool Co., Waynesboro, Pa.	359
Lapointe Machine Tool Co., Hudson, Mass.	351
*Leffel & Co., James, Springfield, O.	453
Leslie Co., Lyndhurst, N. J.	147
*Lidgerwood Mfg. Co., 96 Liberty St., New York	271
*Liak-Belt Co., 39th St. & Stewart Ave., Chicago, Ill.	256
*Locomotive Pulverized Fuel Co., 30 Church St., New York	93
Loneragan Co., J. E., 211-215 Race St., Philadelphia, Pa.	127, 528
Long & Allstatter Co., Hamilton, O.	309
Lukens Steel Co., Coatesville, Pa.	60
Lumen Bearing Co., Buffalo, N. Y.	290
Lynchburg Foundry Co., 816 Peoples Gas Bldg., Chicago, Ill.	156
Lynd-Farquhar Co., Boston, Mass.	348

M

McClave-Brooks Co., Scranton, Pa.	87
McCord Mfg. Co., Detroit, Mich.	169
McCroskey Reimer Co., Meadville, Pa.	380, 381
McIntosh & Seymour Corp'n, Auburn, N. Y.	25
Macomber & Whyte Rope Co., Kenosha, Wis.	280
Madison-Kipp Lubricator Co., Madison, Wis.	172
*Magnesia Association of America, 721 Bulletin Bldg., Philadelphia, Pa.	164, 165
Malleable Iron Fittings Co., Branford, Conn.	157
Manufacturers Equipment Co., Waller & Fillmore Sts., Chicago, Ill.	382
Mark Mfg. Co., P. O. Box G, Chicago, Ill.	160
Marshall Foundry Co., 1st Natl. Bank Bldg., Pittsburgh, Pa.	496
Maxf Grinding Wheel Corp'n, Chester, Mass.	390
Mehl Machine Tool & Die Co., Roselle, N. J.	376, 377
Milburn Co., Alexander, Baltimore, Md.	420
Milton Mfg. Co., Milton, Pa.	406
Milwaukee Reliance Boiler Works, Milwaukee, Wis.	112
Modern Tool Co., Erie, Pa.	360, 361
Monongahela Tube Co., Pittsburgh, Pa.	70
*Morris Machine Works, Baldwinsville, N. Y.	442, 443
Morrison Bros., Dubuque, Ia.	495
*Morse Chain Co., Ithaca, N. Y.	199
Muncie Oil Engine Co., 500 American Blvd., Muncie, Ind.	29
*Murphy Iron Works, Detroit, Mich.	82, 83
Murray Iron Works Co., Burlington, Ia.	54, 55

N

National Acme Co., Cleveland, O.	334, 335
National Automatic Tool Co., Richmond, Ind.	346
*National Meter Co., 299 Broadway, New York	33, 517
*National Pipe Bending Co., New Haven, Conn.	106, 107
National Tool Co., Cleveland, O.	383
Nazel Engineering & Machine Works, 4040 N. 5th St., Philadelphia, Pa.	317
Nelson Blower & Furnace Co., 11 Elkins St., Boston, Mass.	67
Neptune Meter Co., 50 E. 42nd St., New York	518
New Britain Machine Co., New Britain, Conn.	336
New Departure Mfg. Co., Bristol, Conn.	222, 223, 224, 225
New England Butt Co., Providence, R. I.	484
New Haven Sand Blast Co., New Haven, Conn.	450
New Jersey Foundry & Machine Co., 88 West St., New York	273

*Advertisements of firms marked * appear in The Journal, A. S. M. E.*

INDEX TO CONDENSED CATALOGUES

	PAGE
New London Ship & Engine Co., Groton, Conn.....	26
New York Engineering Co., 2 Rector St., New York.....	57
New York Rubber Co., 34 Reade St., New York.....	14, 245
Newhall Chain Forge & Iron Co., 90 West St., New York.....	279
Niagara Machine & Tool Works, Buffalo, N. Y.....	312
Niles-Bement-Pond Co., 111 Broadway, New York.....	344
Noble & Westbrook Mfg. Co., Hartford, Conn.....	368
Nordberg Mfg. Co., Milwaukee, Wis.....	19
*Norma Co. of America, 1790 Broadway, New York.....	226
Norton Co., Worcester, Mass.....	391
Norton Grinding Co., Worcester, Mass.....	362
Norwalk Iron Works Co., So. Norwalk, Conn.....	427
Novo Engine Co., Lansing, Mich.....	444, 445
Nuttall Co., R. D., Pittsburgh, Pa.....	195

O

Ohio Steel Foundry Co., Springfield, O.....	306
Ohio Valley Pulley Works, Maysville, Ky.....	211
Oil & Waste Saving Machine Co., 1509 Real Estate Trust Bldg., Philadelphia, Pa.....	491
Oil City Boiler Works, Oil City, Pa.....	58
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa.....	511
Ott Grinder Co., Indianapolis, Ind.....	363
Oxweld Acetylene Co., 646-686 Frelinghuysen Ave., Newark, N. J.....	421

P

Page Boiler Co., 815-819 Larrabee St., Chicago, Ill.....	59
*Pangborn Corp'n, P. O. Box 859, Hagerstown, Md.....	460, 461
Parks Co., G. M., Fitchburg, Mass.....	472
Pelton Water Wheel Co., Harrison & 19th Sts., San Francisco, Cal.....	452
Penberthy Injector Co., Detroit, Mich.....	152, 153
Pennsylvania Forge Co., Bridesburg, Philadelphia, Pa.....	158
Pfaudler Co., Rochester, N. Y.....	499
Philadelphia Drying Machinery Co., Stokely St., Philadelphia, Pa.....	473
Philadelphia Textile Machinery Co., Philadelphia, Pa.....	474, 475
Phoenix Iron Works Co., Meadville, Pa.....	497
Pickering Governor Co., Portland, Conn.....	166
*Pittsburgh Valve, Foundry & Const. Co., Pittsburgh, Pa.....	132, 133
Platt Iron Works, Dayton, O.....	446
*Poole Engineering & Machine Co., Woodberry, Baltimore, Md.....	196, 197
Portable Machinery Co., Inc., Passaic, N. J.....	263
Pratt & Cady Co., Inc., Hartford, Conn.....	134, 135
*Precision Instrument Co., Detroit, Mich.....	524

Q

*Quasi Arc Weldtrode Co., Inc., 107-109 Lafayette St., New York.....	422
*Quigley Furnace Specialties Co., 26 Cortlandt St., New York.....	94, 100

R

Reeves Pulley Co., Columbus, Ind.....	210
Republic Flow Meters Co., 565 W. Washington Blvd., Chicago, Ill.....	522
Rhoads & Sons, J. E., 12 N. Third St., Philadelphia, Pa.....	238, 239
Richardson-Phoenix Co., 126 Reservoir Ave., Milwaukee, Wis.....	170, 171
Richardson Scale Co., Passaic, N. J.....	514
Riehle Bros. Testing Machine Co., 1424 N. 9th St., Philadelphia, Pa.....	512
*Riley Stoker Co., Ltd., Sanford, Worcester, Mass.....	84
Robins Conveying Belt Co., Park Row Bldg., New York.....	257
Rockwell Co., W. S., 50 Church St., New York.....	413
*Roebling's Sons Co., John A., Trenton, N. J.....	281
Rosendale-Reddaway Belting & Hose Co., Newark, N. J.....	243
Roto Co., Hartford, Conn.....	71
*Royersford Foundry & Machine Co., 52 N. 5th St., Philadelphia, Pa.....	228, 229
Russell, Burdshall & Ward Bolt & Nut Co., Port Chester, N. Y.....	407
Ryerson & Son, Joseph T., 16th & Rockwell Sts., Chicago, Ill.....	366

S

"S-C" Regulator Mfg. Co., Fostoria, O.....	72
S K F Ball Bearing Co., Hartford, Conn.....	227
Safety Car Heating & Lighting Co., 2 Rector St., New York.....	505

*Advertisements of firms marked * appear in The Journal, A. S. M. E.*

INDEX TO CONDENSED CATALOGUES

PAGE

St. John Grate Bar Co., Machinery Dept., The Bourse, Philadelphia, Pa.....	90
Sandusky Foundry & Machine Co., Sandusky, O.....	488
*Sarco Co., Inc., Woolworth Bldg., New York.....	148, 149
*Scaife & Sons Co., Wm. B., Pittsburgh, Pa.....	103, 498
*Schaeffer & Budenberg Mfg. Co., Berry & South Fifth Sts., Brooklyn, N. Y.....	534
Schaum & Uhlinger, Inc., Glenwood Ave. at Second St., Philadelphia, Pa.....	492, 493
*Schieren Co., Chas. A., 30-38 Ferry St., New York.....	240
*Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.....	274, 275
Shimer & Sons, Samuel J., Milton, Pa.....	404
Shultz Belting Co., St. Louis, Mo.....	241
Simmons Co., John, 110 Center St., New York.....	515
Skinner Bros. Mfg. Co., 10th & Tyler Sts., St. Louis, Mo.....	476
Skinner Engine Co., Erie, Pa.....	17
Sleeper & Hartley, Inc., Worcester, Mass.....	486
Sloan & Chace Mfg. Co., Ltd., Sixth Ave. Cor. N. 13th St., Newark, N. J.....	357
Slocum, Avram & Slocum Laboratories, Inc., 531-537 W. 21st St., New York.....	538
*Smith Co., H. B., Westfield, Mass.....	478, 479
Southwark Foundry & Machine Co., 400 Washington Ave., Philadelphia, Pa.....	456
*Spray Engineering Co., 93 Federal St., Boston, Mass.....	113
*Springfield Boiler Co., Springfield, Ill.....	60
Standard Conveyor Co., North St. Paul, Minn.....	261
Standard Roller Bearing Co., Philadelphia, Pa.....	230, 231
Standard Shop Equipment Co., 1413 Somerset St., Philadelphia, Pa.....	384
Steere Engineering Co., Detroit, Mich.....	503
Steinle Turret Machine Co., Madison, Wis.....	332
Stephens Mfg. Co., Roe, Detroit, Mich.....	138
Sterling Blower Co., Hartford, Conn.....	436
Sterling Grinding Wheel Co., Tiffin, O.....	302
Stewart Mfg. Corp'n, 4535-4551 Fullerton Ave., Chicago, Ill.....	293
Stroud & Co., E. H., 928-934 Fullerton Ave., Chicago, Ill.....	466, 467
Sturtevant Co., B. F., Hyde Park, Boston, Mass.....	74, 75
Sullivan Machinery Co., 121 S. Michigan Ave., Chicago, Ill.....	430
Swan & Finch Co., 165 Broadway, New York.....	174
Swenson Evaporator Co., 945 Monadnock Block, Chicago, Ill.....	501

T

Tagliabue Mfg. Co., C. J., 18-88 Thirty-third St., Brooklyn, N. Y.....	535
Tate-Jones & Co., Inc., Pittsburgh, Pa.....	416, 417
Taylor Instrument Cos., Rochester, N. Y.....	536
*The Texas Company, 17 Battery Place, New York.....	175
Textile Machine Works, Reading, Pa.....	485
Thomas Grate Bar Co., Birmingham, Ala.....	88, 89
Tide Water Oil Co., 11 Broadway, New York.....	176
Toledo Machine & Tool Co., Toledo, O.....	313
Torrington Mfg. Co., Torrington, Conn.....	483
Turner Machine Co., Danbury, Conn.....	347

U

Uehling Instrument Co., 2011 Empire Bldg., New York.....	525
Uniflow Boiler Co., Inc., Philadelphia, Pa.....	62
*Union Drawn Steel Co., Beaver Falls, Pa.....	300
Union Drop Forge Co., 358 W. Grand Ave., Chicago, Ill.....	302
Union Iron Works, Erie, Pa.....	61
Union Spring & Mfg. Co., 1207 Fulton Bldg., Pittsburgh, Pa.....	424
United Lead Co., 111 Broadway, New York.....	299
U. S. Ball Bearing Mfg. Co., Palmer St. & Kolmar Ave., Chicago, Ill.....	232
United States Gauge Co., 67 Wall St., New York.....	529
United States Metallic Packing Co., 221 N. 13th St., Philadelphia, Pa.....	181
Universal Boring Machine Co., Hudson, Mass.....	343
Universal Grinding Machine Co., Fitchburg, Mass.....	364

V

Van Dorn & Dutton Co., Cleveland, O.....	370
Van Dorn Electric Tool Co., Cleveland, O.....	370
*Vibration Specialty Co., Harrison Bldg., Philadelphia, Pa.....	487
Victor Saw Works, Springfield, Mass.....	387
*Vilter Mfg. Co., 1194-1196 Clinton St., Milwaukee, Wis.....	18
Vogt Machine Co., Henry, Louisville, Ky.....	63
Vulcan Steam Forging Co., 247 Rano St., Buffalo, N. Y.....	303

W

Walker & Co., Ltd., James, 27 Thames St., New York.....	182
Walsh & Weidner Boiler Co., Chattanooga, Tenn.....	64

Advertisements of firms marked * appear in The Journal, A. S. M. E.

Ward Engineering Works, Charles, Charleston, W. Va.....	
*Warner & Swasey Co., Cleveland, O.....	328.
Washburn & Granger, 50 Church St., New York.....	
Watson-Stillman Co., 35 Church St., New York.....	
Webster & Co., Warren, Camden, N. J.....	108, 109.
Webster & Perks Tool Co., 300 Center St., Springfield, O.....	
Weller Mfg. Co., 1820-1856 N. Kostner Ave., Chicago, Ill.....	258, 259.
Wellman-Seaver-Morgan Co., Cleveland, O.....	
*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.....	114.
Westinghouse Traction Brake Co., Wilmerding, Pa.....	432.
*Weston Electrical Instrument Co., 49 Weston Ave., Waverly Park, Newark, N. J.....	
Wheeler Condenser & Engineering Co., Carteret, N. J.....	
Wheelock, Lovejoy & Co., 23 Cliff St., New York.....	
Whitney Mfg. Co., Hartford, Conn.....	
*Wickes Boiler Co., Saginaw, Mich.....	
Wilbraham-Green Blower Co., Pottstown, Pa.....	
Wilfert Co., John, 258 Broadway, New York.....	136.
Willcox Engineering Co., Saginaw, Mich.....	
Williams & Co., J. H., 70 Richards St., Brooklyn, N. Y.....	
Williams, Inc., Franklin, 41 Cortlandt St., New York.....	
Williams Foundry & Machine Co., 54-56 Cherry St., Akron, O.....	
*Williams Patent Crusher & Pulverizer Co., Old Colony Bldg., Chicago, Ill.....	468.
Williams, White & Co., Moline, Ill.....	
Wilson Welder & Metals Co., Inc., 2 Rector St., New York.....	
Wisconsin Electric Co., Racine, Wis.....	
Wood & Co., R. D., Philadelphia, Pa.....	
Wood Turret Machine Co., Brazil, Ind.....	330.
*Wood's Sons Co., T. B., Chambersburg, Pa.....	212.
Woodison Co., E. J., Detroit, Mich.....	
Worcester Pressed Steel Co., Worcester, Mass.....	
*Worthington Pump & Machinery Corp'n, 115 Broadway, New York.....	30, 117, 431.
Wright Wire Co., Worcester, Mass.....	
Wyckoff & Son Co., A., Elmira, N. Y.....	

Y

*Yarnall-Warinf Co., 7603-20 Queen St. Chestnut Hill, Philadelphia, Pa.....	
---	--

*Advertisements of firms marked * appear in The Journal, A. S. M. E.*

**CATALOGUE SECTION
PART I**

Power Plant Equipment

13

Pages 15-184

ALLIS-CHALMERS MFG. CO.

MILWAUKEE, WIS.

Sales Offices in Most Large Cities in the United States

FOREIGN OFFICE: LONDON

NEW ORLEANS OFFICE: Maison Blanche Bldg.

NEW YORK OFFICE: 50 Church Street



Four Allis-Chalmers 2200 K V A Alternators
connected to Allis-Chalmers Engines



Allis-Chalmers Twin Duplex Oil Engine
Direct connected to 60-Cycle
Allis-Chalmers Engine Type Alternator

COMPLETE
LINE OF
ELECTRICAL
MACHINERY



Standard
4000 K W Steam Turbine
and Alternator Unit

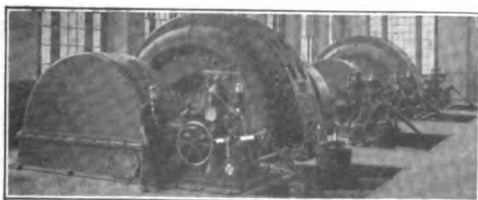
STEAM ENGINES,
CORLISS TYPE
[STEAM TURBINES
CONDENSERS

15

OIL ENGINES, DIESEL TYPE
GAS ENGINES. PUMPING ENGINES
CENTRIFUGAL PUMPS. HYDRAULIC TURBINES
MINING & CONCENTRATING MACHINERY
CRUSHING & CEMENT MACHINERY
FLOUR MILL MACHINERY
SAW MILL MACHINERY
AIR COMPRESSORS. BLOWING ENGINES
FARM TRACTORS
TRANSMISSION MACH'Y, PULLEYS, SHAFING, ETC.



Type "S"
Centrifugal Pump
Connected to
Type "A N" Motor



Allis-Chalmers Impulse Wheels: 46,000 H. P. Concentrated
in Two Units, 2160 Foot Head, 375 R. P. M.

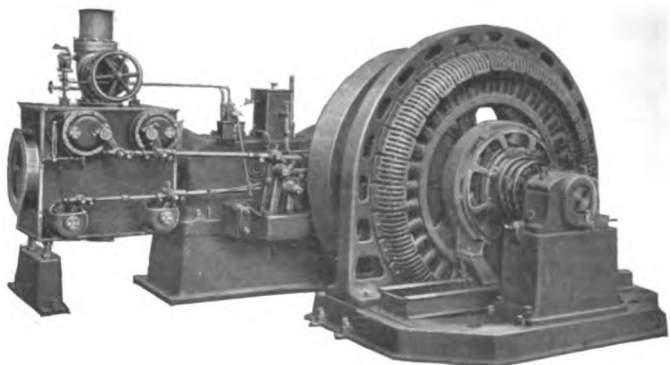
BALL ENGINE CO.

ERIE, PENNSYLVANIA

Builders of Corliss-Valve and Single-Valve Engines; Horizontal and Vertical Side-Crank Engines; Tandem- and Cross-Compound Single-Valve Engines, Corliss-Valve Compound and Single-Cylinder Engines

BALL HIGH-SPEED CORLISS ENGINES

The feature which distinguishes this engine from other four-valve shaft-governed engines is the patented non-detaching valve gear, which imparts the same movement to the valves that the drop cut-off of the slow-speed Corliss produces by picking up and dropping them. This permits the use of the best form of valve, and the valves are given the movement necessary for the greatest durability and tightness.



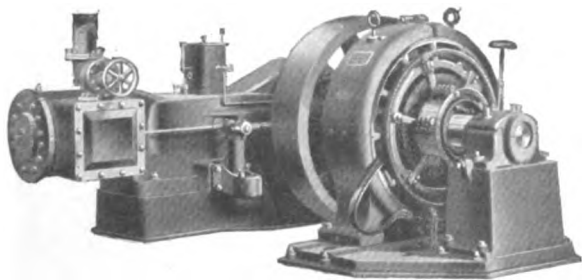
Horizontal Single-Cylinder Side-Crank Engine—Corliss Type

Built in sizes from 100 H. P. to 1600 H. P. in the single-cylinder and cross-compound types.

These engines excel in economy and regulation and are especially adapted for electric service.

BALL SINGLE-VALVE AUTOMATIC ENGINES

These engines are the result of a long experience in building engines for electric service. They are superior in design and construction. The regulation and economy are the best of their type.



Single-Cylinder Side-Crank Engine—Single-Valve Type

Built in sizes from 25 H. P. to 800 H. P. in the single-cylinder tandem-compound and cross-compound types.



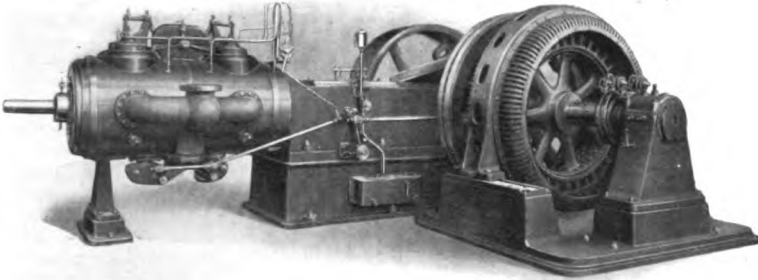
SKINNER ENGINE COMPANY

ERIE, PA., U. S. A.

Branches in 32 Cities

Builders of High Grade Automatic Engines

THE "UNIVERSAL UNAFLOW"



THE MOST ECONOMICAL STEAM ENGINE EVER BUILT

Any engine will *operate* noncondensing and condensing; but the "UNIVERSAL UNAFLOW" is the only engine that will give *maximum economy* under both conditions, because it is

THE ONLY UNAFLOW ENGINE:

That operates noncondensing, as well as condensing, with *small clearances*.

That automatically changes, while in operation, from a condensing to a non-condensing engine, and *vice versa*, with changes of exhaust pressure, giving the maximum economy under both conditions.

That has expanding poppet valves which remain STEAM-TIGHT under all temperature and pressure changes.



This engine has demonstrated its economy over other makes of engines, and against outside current, in hundreds of power plants.

Built only
Because Patented } by Skinner Engine Co.

Write for bulletin

THE VILTER MANUFACTURING CO.

1194-1196 CLINTON ST., MILWAUKEE, WIS., U. S. A.

Builders of Ice Making and Refrigerating Machinery, Corliss Engines, Poppet Valve Engines, Ammonia Fittings, Special Machinery, Etc.

VILTER TANDEM COMPOUND POPPET VALVE ENGINE



Fig. 1



Fig. 2



Fig. 3

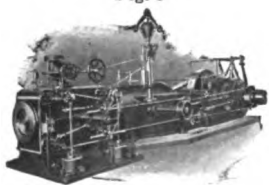


Fig. 4

Fig. 1 illustrates Vilter Tandem Compound Engine with poppet high pressure and Corliss low pressure cylinder direct connected to Rolling Mill compressor frame. The most economical combination known using high pressure superheated steam. A leading feature is the valve gear operated through wrist plates driven from eccentrics.

Fig. 2. Vilter horizontal high speed ammonia compressors are simple in design, rugged in appearance, and in the character of service they give. They are specially designed for direct connection to the newest types of high-speed prime movers, and particularly adapted for direct connection to synchronous motors, a method of drive which is proving so highly economical and efficient.

Fig. 3. The Rolling Mill frame machine is built along very heavy lines for all conditions of service. It is used with only slight modifications in all sizes of compressors. Its very appearance gives assurance and proof of its strength and reliability. All parts of the base rest upon the foundation, thus giving a uniform distribution of the load and insuring maximum stability and rigidity.

Fig. 4. The Rolling Mill type Corliss Engine is of massive construction throughout, the pillow block and guide being made in one casting, securing great strength and rigidity. It is adapted to any class of service from a steady belt load to direct connected electrical units.

Fig. 5. The belt-driven machines are furnished in either single or duplex units. These units may be driven by electric motor, gas or oil engines,

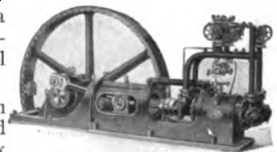


Fig. 5

etc. Single units built in sizes from 6 to 175 tons daily refrigerating capacity, duplex units in sizes from 12 to 750 tons daily refrigerating capacity.

SMALL VERTICAL TWIN CYLINDER AMMONIA COMPRESSORS

Fig. 6. A small, single-acting compressor, especially designed for users of comparatively small quantities of refrigeration. It is reasonable in first cost. Economical to operate. Simple in construction. Needs very little attention. Is always ready for service. Built in sizes from 1 ton to 20 tons daily refrigerating capacity.



Fig. 6

LITERATURE

Bulletins, catalogues and full data regarding our product mailed on request.



NORDBERG MFG. CO.

MILWAUKEE, WIS.

Engineers and Designers of High Efficiency Poppet Valve Engines, Poppet Uniflow Engines, Corliss Engines, High Compression Oil Engines, Nordberg-Carels Diesel Type Engines, Air Compressors, Blowing Engines, Steam, Air and Electric Hoists

POPPET VALVE ENGINES

Nordberg Poppet Valve Engines operate with steam consumptions as low as 16 lb. per hp. hour non-condensing. These engines are of high speed design with new type of valve gear and are built especially for use with high pressure superheated steam.

POPPET VALVE UNIFLOW ENGINES

These engines have Poppet steam valves but exhaust through ports in the cylinder wall uncovered by the piston. A Uniflow Engine operating on a widely fluctuating load gives a lower average steam consumption than a compound condensing engine.

CORLISS ENGINES

Nordberg Corliss Engines are built in all sizes with both the standard and Long Range valve gear.

HIGH COMPRESSION TWO CYCLE OIL ENGINES

This is the simplest oil engine on the market today. There are no valve gears or valves subject to the working pressure and heat. The only valve is a low pressure piston valve for scavenging air. These engines are built in three sizes only, 50, 100 and 200 hp.

NORDBERG-CARELS DIESEL TYPE ENGINES

In large sizes up to and including 1,500 hp., the Nordberg Company builds Diesel Engines under patents of Carels Frères, who have built more large Diesel Engines than any other company in the world.

ELECTRIC HOISTS

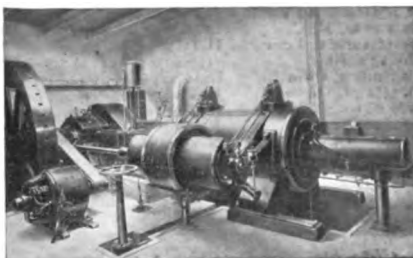
Nordberg Electric Hoists are built in sizes having drums from four feet in diameter up to the largest now operating in this country.

STEAM AND AIR HOISTS

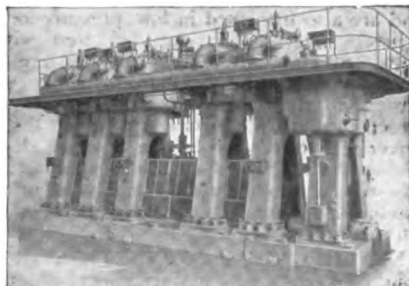
Nordberg Steam Hoists are well known to all mining men. Practically all of the large hoists for high speeds and great depths have been built by the Nordberg Co.

All of the successful compound condensing steam hoists and all the Air Hoists are of Nordberg make.

Bulletins sent upon request.



Nordberg Poppet Valve Engine as recommended for non-condensing installations. The valve gear opens and closes the valves positively without the use of springs or dash pot and all valves seat in removable cages, which are fitted in the heads



Nordberg-Carels Diesel type engine of 1250 / brake hp. This is a two-cycle engine of the design most widely used in large sizes throughout Europe and Asia



Nordberg First Motion electric driven hoist for the Elm Orlu Mining Co., Butte, Mont.; load 32,000 lb.; depth 3,500 ft.; hoisting speed 2,500 ft. per minute

GENERAL ELECTRIC COMPANY

GENERAL OFFICE: SCHENECTADY, N. Y.

Manufacturers of Complete Electrical Power Plant Equipments and Supplies

BRANCH OFFICES:

Atlanta, Ga.	Denver, Colo.	Los Angeles, Cal.	Providence, R. I.
Baltimore, Md.	Detroit, Mich.	Louisville, Ky.	Richmond, Va.
Birmingham, Ala.	Des Moines, Iowa	Memphis, Tenn.	Rochester, N. Y.
Boston, Mass.	Duluth, Minn.	Milwaukee, Wis.	St. Louis, Mo.
Buffalo, N. Y.	Elmira, N. Y.	Minneapolis, Minn.	Salt Lake City, Utah
Butte, Mont.	Eric, Pa.	Nashville, Tenn.	San Francisco, Cal.
Charleston, W. Va.	*El Paso, Tex.	New Haven, Conn.	Schenectady, N. Y.
Charlotte, N. C.	Fort Wayne, Ind.	New Orleans, La.	Seattle, Wash.
Chattanooga, Tenn.	Hartford, Conn.	New York, N. Y.	Spokane, Wash.
Chicago, Ill.	*Houston, Tex.	Niagara Falls, N. Y.	Springfield, Mass.
Cincinnati, Ohio	Indianapolis, Ind.	*Oklahoma City, Okla.	Syracuse, N. Y.
Cleveland, Ohio	Jacksonville, Fla.	Omaha, Neb.	Toledo, Ohio
Columbus, Ohio	Joplin, Mo.	Philadelphia, Pa.	Washington, D. C.
*Dallas, Tex.	Kansas City, Mo.	Pittsburgh, Pa.	Youngstown, Ohio
Dayton, Ohio	Knoxville, Tenn.	Portland, Ore.	

*Southwest General Electric Company.

For CANADIAN BUSINESS refer to Canadian General Electric Company, Ltd., Toronto, Ont.
GENERAL FOREIGN SALES OFFICES, Schenectady, N. Y.; Equitable Bldg., 120 Broadway,
New York City; 83 Cannon St., London, E. C., England.



The General Electric Company makes practically every type of apparatus for the generation, transmission and application of electricity as light, heat, power and a means of transportation. Only a few of these products are described here.

GENERATOR APPARATUS: Curtis turbines are built in sizes from the smallest exciter set to 50,000 KV-A capacity—the largest single generating unit in the world. They are suitable for condensing or non-condensing service, and are also furnished in low pressure or exhaust steam, and mixed pressure types. The latter can be used with high or low pressure steam or both. Steam extraction turbines are furnished where exhaust steam is needed for heating or manufacturing purposes. Engine driven generators are regularly furnished in capacities ranging from 5 to 2700 Kw., direct current and from 30 to 5,000 Kw., alternating current. Water wheel driven generators have been built in all sizes up to 20,000 KV-A, the largest in the world. The General Electric Company has had more experience than any other company in building both horizontal and vertical generators. These machines do not deteriorate in their windings and are very conservative in temperature ratings.

SYNCHRONOUS CONVERTERS—MOTOR GENERATORS: Synchronous converters and motor-generator sets provide an economical method for changing electric power of any standard frequency and voltage from alternating to direct current or vice versa.

SWITCHBOARDS: For all ordinary requirements, the necessary panels can be selected from the G-E catalogs of Standard Unit Panels, and combined into a switchboard that will satisfy every requirement of the installation. The advantages of this method are convenience in ordering, prompt shipment and low price, the latter two resulting from the elimination of engineering and drafting on the individual order. The Standard unit system is explained in Bulletin 47001.

For high voltage plants and other cases where unusual requirements must be met, special switchboards are designed to meet any conditions of control.

Switchboard specialists are located at many of the principal offices of the company and will furnish data which will enable the engineer to specify a complete switchboard especially adapted to his particular requirements and with all parts built, assembled and tested as a unit by one company.

INSTRUMENTS—METERS: Switchboard and testing instruments and all kinds of electric meters cover fully the requirements for measurement of power.

REGULATORS: Automatic regulators are furnished for keeping the voltages constant on alternating or direct current power and lighting circuits.

GENERAL ELECTRIC COMPANY

TRANSFORMERS: Type H distribution transformers have unusually high factors of safety which ensure safe and reliable service under the most severe operating conditions. The General Electric Company has adopted the N. E. L. A. standardization of voltages and capacities, and stock capacities 200 KV-A and less for use on line voltages 33,000 volts and below.

Type H circular coil power transformers are built in all sizes and voltages. Transformers for potentials as high as 150,000 volts and in capacities up to 25,000 KV-A (50,000 KV-A, output) are in successful operation. These transformers have many superior features ensuring unusual ruggedness when operating under modern transmission conditions, where strains due to abnormal current, voltage and frequency are encountered. Ratings have been standardized.

The standard ratings adopted on distribution and power transformers will cover the majority of operating requirements.

LIGHTNING-ARRESTERS: For alternating current circuits the aluminum arrester is recommended as giving the best protection attainable for station equipment.

For distributing transformers, the graded shunt resistance multigap or the compression chamber multigap arrester may be used. The former is sensitive over a wide range of lightning frequencies and should be installed for protection of the larger transformers. The compression chamber arrester, lower priced and slightly less efficient, should be used to protect all the smaller transformers.

For direct current circuits the magnetic blow-out arrester is available. Where a very high degree of protection is desired aluminum arresters should be used.

WIRE AND CABLE: The General Electric Company manufactures wires and cables insulated with paper, varnished cambric, rubber or composite (graded) insulation. To meet different conditions of service these cables are furnished with protective coverings of cotton, asbestos, lead, band steel or wire armor.

LAMPS, INCANDESCENT AND ARC: Standard lighting units ranging from miniature to 1000 watt Mazda lamps and magnetite arc lamps for lighting large areas are carried in stock. Lighting specialists and illuminating engineers of the General Electric Company will assist in laying out any lighting system.

WIRING DEVICES: G-E reliable wiring devices include sockets, receptacles, switches, cut-outs, fuses, attaching plugs, rosettes, cleats, insulators, and numerous wiring specialties. All these types are N. E. C. standard.

MOTORS AND CONTROLLERS: ALTERNATING CURRENT MOTORS for all standard voltages and frequencies; constant or variable speed; for continuous or intermittent duty; hand or automatic control.

DIRECT CURRENT MOTORS for 115, 230, and 550 volts; slow or moderate speed; belt, chain, gear or direct drive. Constant, variable or adjustable speed for continuous or intermittent duty. Suitable control for any service.

All motors are insulated for long life. Specially insulated motors for service in acid or alkaline vapors, excessive alkaline dust, or temperatures as high as 150° C. can be furnished.

The General Electric Company has a motor for every power application, large or small, a controller for every motor, and a specialist who can assist in the combined application to obtain the most satisfactory and economical results.

FLOW METERS: The General Electric Company has developed a practical device for measuring the flow of steam in pipes. The G-E steam flow meter can be installed in any sized pipe at a small expense, and will give reliable readings of the flow. They are specially useful in the boiler plant and turbine room for measuring the output of the individual boiler and the input of the turbines. G-E flow meters are also furnished for measuring the flow of water, air and natural gas.

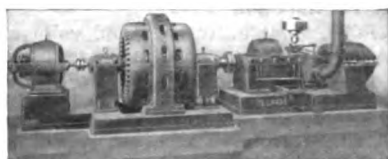
BULLETINS—FURTHER INFORMATION: Bulletins describing and illustrating apparatus and applications are obtainable from the nearest office.



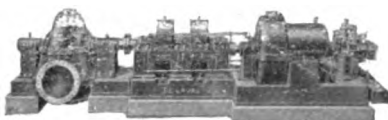
DE LAVAL STEAM TURBINE CO.

TRENTON, N. J.

Builders of Steam Turbines, Centrifugal Pumps, Blowers and Compressors, Speed-Reducing Gears and Special Centrifugal Machinery



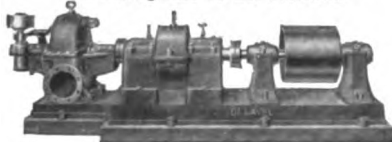
Alternator with Exciter, Driven by Geared Turbine



Geared-Turbine-Driven Centrifugal Pump;
30,000,000 Imp. Gal. per Day against
210 Ft. Head



Centrifugal Compressor Driven by Electric-
Motor through Speeding-up Gear; 25,000
Cu. Ft. against 16 Lb. Pressure



Geared Turbine for Rope or Belt Drive



Geared Turbine for Driving Slow or Moderate
Speed Machinery, such as Rolling
Mills, Paper Machines, Ships'
Propellers, etc.

DE LAVAL STEAM TURBINES are adapted for all powers from 1 to 15,000 kw. and for all steam conditions.

The **De Laval Single-Stage Turbine** of the impulse type gives unexcelled efficiency in sizes from 1 to 200 h. p.

The **De Laval Velocity-Stage Turbine** is most simple and reliable, and, where the exhaust steam can be utilized, is suitable for direct connection to centrifugal pumps, blowers, electric generators, etc. It is made in all sizes up to 1000 h. p.

The **De Laval Combined Velocity-Stage and Pressure-Stage Turbine** combines high efficiency with moderate cost, and is widely used for direct connection to high speed machinery and for driving slow-speed machinery through speed-reducing gears. It is built in all sizes up to 2000 h. p.

The **De Laval Pressure-Stage Turbine** gives the highest efficiency. It can be directly connected to moderately high-speed machinery, such as alternators and centrifugal blowers and compressors, while for driving slow-speed machinery, such as large centrifugal pumps, direct-current generators, rope and belt drives and ships' propellers, or for direct connection to machinery, speed-reducing gears are employed. It is built in all sizes from 600 to 15,000 h. p.

DE LAVAL CENTRIFUGAL PUMPS are built in the single-stage and multi-stage types for all heads and capacities and for all services.

DE LAVAL CENTRIFUGAL BLOWERS AND COMPRESSORS are built in all capacities and for all pressures up to 120 lb. per sq. inch. Except for very low pressures, the speeds permit of direct connection to steam turbines. Close regulation, either for constant pressure or constant volume, is secured by sensitive but simple and rugged governors.

DE LAVAL SPEED REDUCING GEARS are of the double-helical type.

The cutting methods employed are such that the correct pitch, angle and tooth contour are produced and quiet running and long life are secured.

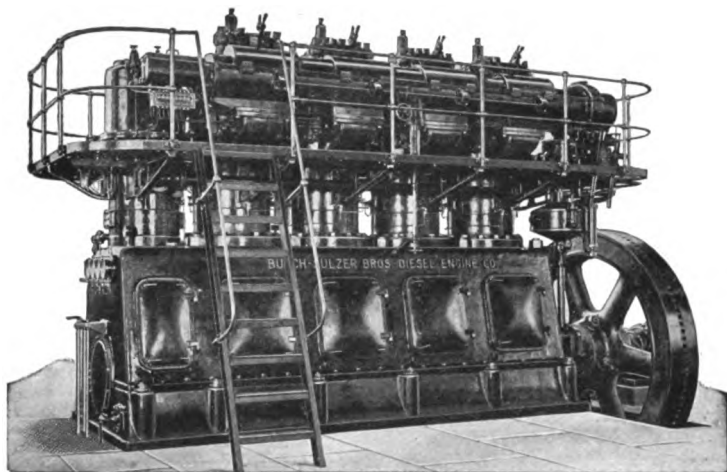
All De Laval machinery is characterized by horizontally split casings, moderate peripheral speeds, large running clearances and ample bearing surfaces and shaft sizes. All apparatus is built on a limit-gage, interchangeable basis. *The performance of every machine is guaranteed, both as to capacity and efficiency, and a complete test is carried out at the shops before shipment.*

BUSCH-SULZER BROS.-DIESEL ENGINE COMPANY

ST. LOUIS, MO.

Builders of Diesel Engines

This Company is the original and was, from 1898 to 1911, the only company manufacturing DIESEL Engines in America. It owns all U. S. patents granted to Dr. Rudolph Diesel, and is closely associated with the old firm of Sulzer Bros., of Winterthur, Switzerland, with which it is in intimate co-operation.



23



STANDING: Original manufacturers of the Diesel Engine in America. We can refer you to satisfied users of over 100,000 H. P. of Diesel Engines built by us during the past fifteen years, in plants of from 120 H. P. to 3600 H. P. installed in Central Stations, Pumping Plants, Flour Mills, Ice Plants and Industrial Plants.

MANUFACTURING FACILITIES: New manufacturing plant at St. Louis specially designed and equipped for building of high grade Diesel Engines—devoted solely to building Diesels.

QUALITY: Long years of experience in design, the selection of raw materials, the requisite refinement in manufacture afforded by adequate shop facilities, insure reliability, low upkeep and long life.

PRICES: Groups of engines of standard sizes are brought through factory on shop order—thus reducing manufacturing costs as low as is commensurate with quality of product.

TYPE AND SIZES: Type B—vertical—four-cylinder—single-acting—4-stroke cycle. Sizes—120 H. P., 165 H. P., 250 H. P., 365 H. P., 520 H. P. Medium speeds—suitable for belt, rope, or direct coupled drive.

Type B supersedes Type A, is equipped with compressor built integral, shaft maintained in factory alignment by rigid bearings, forced feed lubrication, etc., etc. Type M Marine Diesel Engines—particulars on request.

PUBLICATIONS: Diesel Engine performance bulletins and operating records in Central Stations, Water Works, Ice Plants, Flour Mills, Industrial Plants, gladly mailed on request.

FULTON IRON WORKS CO.

Established 1852

MAIN OFFICE AND WORKS, ST. LOUIS, MO.

Builders of Fulton-Tosi Oil Engines, Diesel System; Corliss and Medium Speed Steam Engines

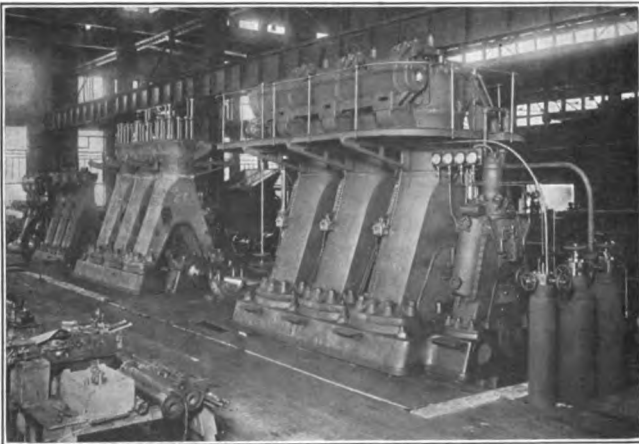
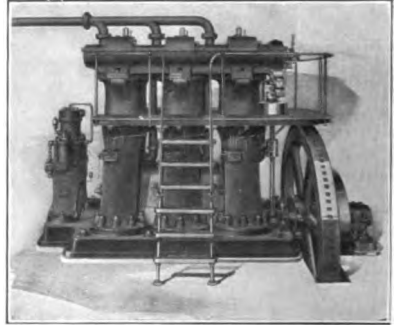
FULTON-TOSI OIL ENGINES (Diesel Type)

The Fulton-Tosi Four-Cycle Oil Engine is built in the vertical form, "A" frame, and in two, three, four and six cylinder arrangement. The engine is designed to operate on the cheapest petroleum, crude or fuel oils, or tar oils, with greatest reliability and economy, and as ignition is insured by the heat of compression, no hot bulb, electric spark, or other exterior means of ignition is required.

The engine may be started up from cold within one minute, without any troublesome or time-consuming preliminaries.

The operation of the engine is comparatively quiet, very clean and perfectly safe, permitting of its installation almost anywhere. Tanks for the storage of fuel oil may be buried under buildings, driveways, or in any other convenient location, without interfering with the use of the space above for other purposes.

The Fulton-Tosi Four-Cycle Oil Engine is built in sizes ranging from 100 B.H.P. in two cylinders to 1000 B.H.P. in six cylinders. These engines are suitable for any power purpose, including electric light and power plants, water works, flour mills, textile mills, irrigation plants, etc. Where the requirements as to regularity of speed are extremely exacting, we recommend the selection of an engine with at least three cylinders.



Diesel Engine Erecting Floor

*Bulletin
800 giving
details
will be
gladly
forwarded
upon
request.*

FULTON-CORLISS STEAM ENGINES are built in horizontal and vertical types; simple, tandem, or cross compound up to 3000 H.P. This is probably the heaviest line of releasing gear Corliss engines built in America.

For higher speed work we build a line of non-releasing gear Corliss valve engines, the steam economy of which corresponds closely to that of the low speed releasing gear line.

"Over sixty years of successful manufacturing."

McINTOSH & SEYMOUR CORPORATION

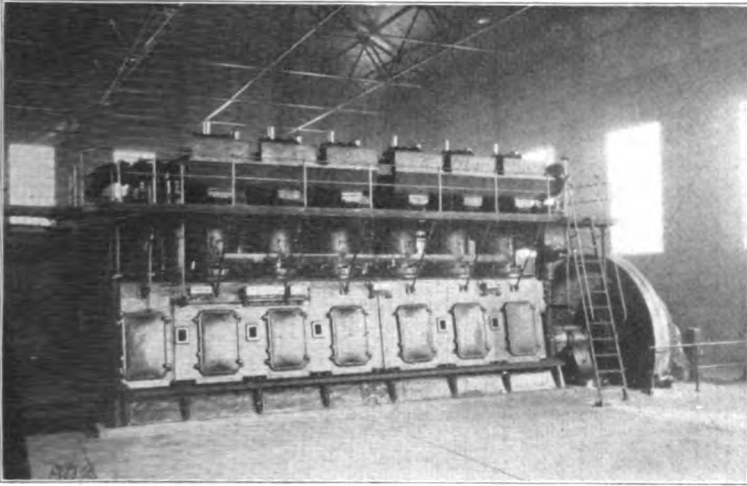
AUBURN, N. Y., U. S. A.

Builders of Stationary and Marine Diesel Type Oil Engines

BRANCH OFFICES

**NEW YORK CITY, 3006 Singer Bldg.
EL PASO, 1107 East Nevada St.
DALLAS, 309 Interurban Bldg.**

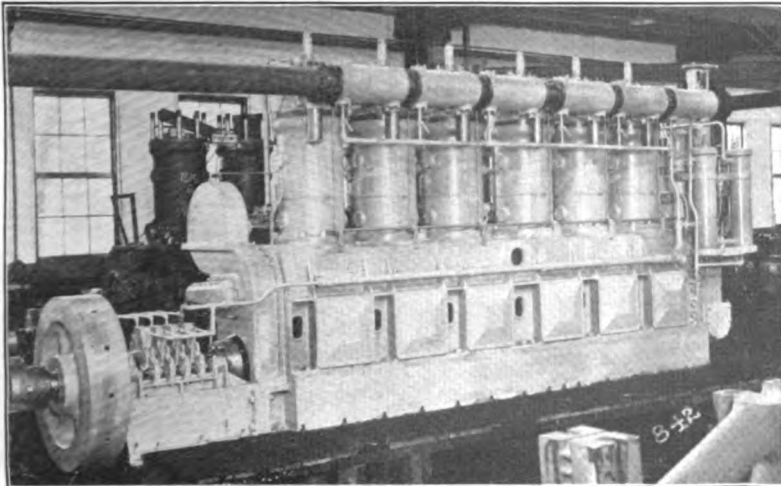
**KANSAS CITY, 700 Interstate Bldg.
SAN FRANCISCO, 815 Sheldon Bldg.**



25

The cut just above shows One of Four 1000 B. H. P., 6 cylinder, 4 cycle, size B-44 Diesel Type Oil Engines, operating continuously at full load.

While the view below shows a 500 B. H. P. Diesel type, direct reversible Marine Oil Engine, a vast number of which are now passing through the Shops for installation in steel and wooden ships. This photograph was taken on the test bed in the Shop.



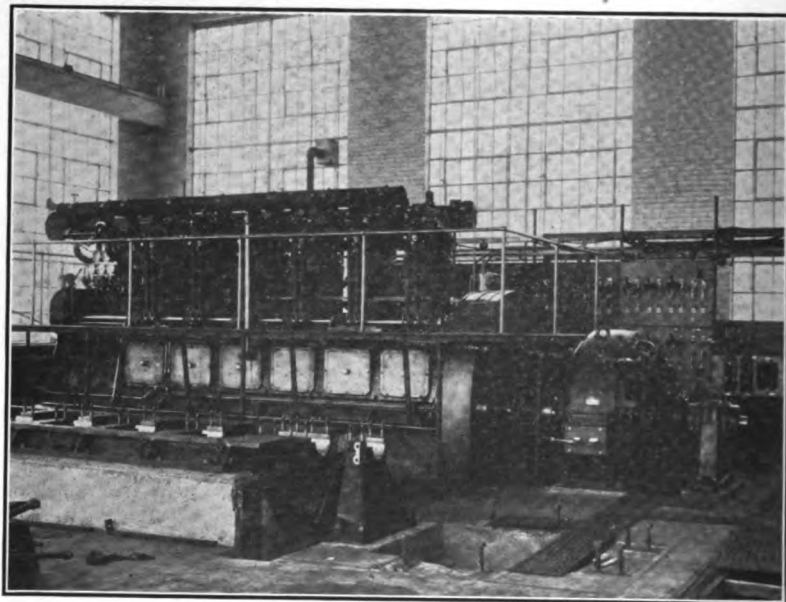
NEW LONDON SHIP & ENGINE CO.

GROTON, CONN., U. S. A.

Manufacturers of Stationary and Marine Diesel Engines

NELSECO DIESEL ENGINES

Burn the same cheap fuel oil, or crude, as is commonly used under steam boilers.



360 H. P. Four-Cycle Nelseco Diesel Crude Oil Stationary Engine

Nelseco Diesel engines are always ready for instant starting.

They are simple in design, construction, and operation—and the upkeep very low.

Over 90,000 H. P. in Service, and over 50,000 H. P. Building

Gold Medal of Honor—Panama Pacific Exposition.

Adopted by United States and Foreign Governments.



TRADE MARK

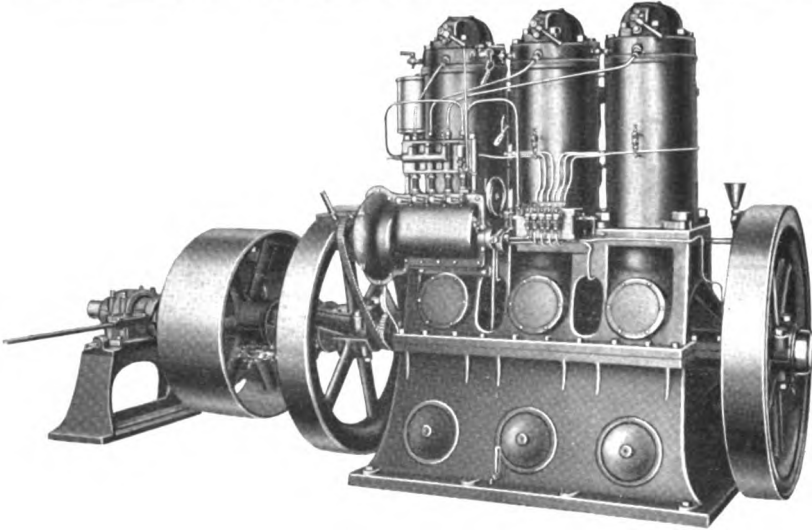
THE ANDERSON FOUNDRY & MACHINE WORKS

Established 1872

ANDERSON, IND.

NEW YORK OFFICE: SINGER BUILDING

Oil Engines; Brick and Tile Presses; Tin Plate Machinery; Grey Iron Castings; Special Machinery



27

THE ANDERSON OIL ENGINE

Two Cycle—Heavy Duty—Moderate Speed—Low Compression—Solid Fuel Injection—Deflector Hot Plate Vaporization and Ignition, by which all carbon deposits in the cylinder are burned up and eliminated.

Operates economically on all kinds of fuel, kerosene to Texas Navy Fuel Oil, 18° Baumé, with no adjustments whatever.

Force feed lubrication for cylinders—Continuous pressure circulating system for the main bearings, crank pins and other moving parts, insuring the least possible lubricating oil consumption.

Small Floor Space—Low Head Room—Light Weight.

Everything controlled from one position—Air Starting Valve—Individual Pump Levers—Air Control—Slow Down and Stop Control—Time of Fuel Injection Control—Lubricators—Water Injection.

Simple and easy to start. Runs in either direction with no special adjustments.

Low First Cost—Very Low Maintenance—Least possible operating cost.

Suitable for all stationary power purposes.

Arranged with special base and reverse gear for marine purposes.

DATA

Horse Power	Cylinders			R. P. M.	Floor Space	Shipping Wt.
	No.	Bore	Stroke			
15-20	1	8"	10"	420	42" × 50"	2500 lbs.
25-30	1	10"	14"	340	42" × 59"	6800 lbs.
50-60	2	10"	14"	340	42" × 76"	8800 lbs.
75-90	3	10"	14"	340	42" × 93"	10500 lbs.
100-120	4	10"	14"	340	42" × 110"	13800 lbs.

Detailed Specifications and Prices on Request

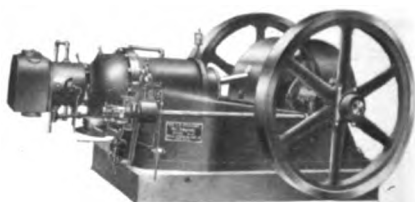
DE LA VERGNE MACHINE COMPANY

1123 EAST 138TH St., NEW YORK CITY

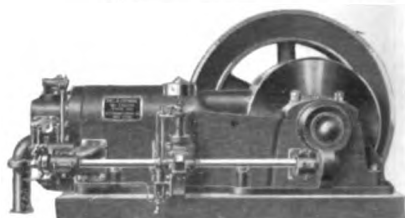
Manufacturers of Oil Engines, Refrigerating Machinery, Ice Machines

DE LA VERGNE OIL ENGINES

Type "HA"—1895 to 1918—No Air Compressor—Fuel Consumption .9 Pound Oil per Horsepower Hour—Oil not Heavier than 24 Degrees Beaumé.

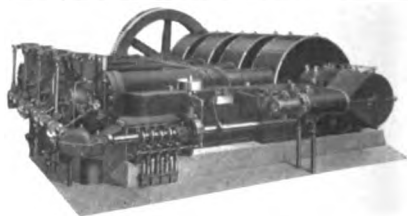


Type "FH"—1909 to 1918—Two-Stage Air Compressor—Fuel Consumption .45 Pound per Horsepower Hour—Any Fuel or Crude Oil.

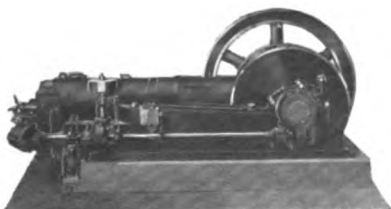
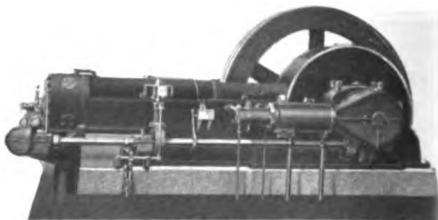


28

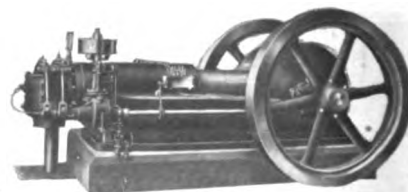
Improved Type "FH"—1915 to 1918—Same in Principle as First "FH," but Improved Construction.



Type "FD" (De La Vergne Diesel)—1917 to 1918—Two- and Three-Stage Air Compressors—Fuel Consumption .42 Pound per Horsepower Hour—Any Fuel or Crude Oil.



Type "P"—1917 to 1918—No Air Compressor—Fuel Consumption .42 Pound per Horsepower Hour—Any Fuel or Crude Oil.



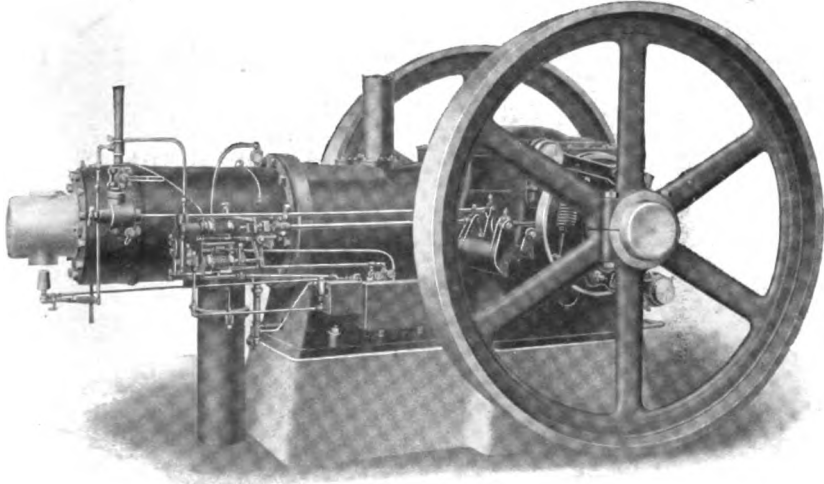
Type "DH"—1915 to 1918—No Air Compressor—Fuel Consumption .55 Pound per Horsepower Hour—Any Fuel or Crude Oil.

MUNCIE OIL ENGINE COMPANY

500 AMERICAN BLVD., MUNCIE, INDIANA, U. S. A.

THE MUNCIE OIL ENGINE

Single Cylinder Heavy Duty Crude and Fuel Oil Engines
Medium Compression Low Speed. Sizes 10 to 125 H. P.



100 H. P. Type C Heavy Duty Design

Automatic Governor, regulation for intermittent loads within two percent, ideal where steadiness is desired on changing loads.

Standard Belted with Friction Clutch Pulley, Standard Direct Coupled with Friction Cut-off Coupling and Special Electric Types.

GENERAL SPECIFICATIONS

H. P.	Speed R. P. M.	Clutch Pulley	Floor Space	Shipping Weight
10	375	20"x 6"	6'- 6"x 5'-0"	2700
20	250	16"x12"	7'-11"x 8'-3"	5600
25	250	22"x12"	8'-11"x 9'-6"	8050
30	250	24"x12"	9'- 3"x 9'-6"	9000
35	250	28"x12"	9'- 3"x 9'-6"	9500
40	265	32"x12"	10'- 9"x12'-0"	14000
45	250	34"x12"	10'-10"x12'-0"	15000
50	250	36"x12"	10'-10"x12'-0"	16000
55	250	38"x12"	11'- 4"x12'-0"	17000
60	240	42"x12"	11'- 4"x12'-0"	18000
70	225	48"x14"	12'- 3"x12'-6"	22000
80	200	60"x14"	13'- 3"x13'-0"	26000
85	200	64"x14"	13'- 3"x13'-0"	27500
100	190	72"x16"	14'- 7"x15'-8"	32500
125	190	76"x18"	14'- 7"x15'-8"	36000

Use 24° to 28° Baumé Gravity Fuel Oils ideally or other oils from kerosene or gas oil, to 18° Crude. The Fuel Consumption .60 pound per B. H. P. makes them very economical in service.

The complete line of sizes are rigidly constructed to withstand the most severe service. Over 40,000 H. P. in use.

Special Bulletins are issued on the various types and sizes. Write for Catalogue No. 23.

WORTHINGTON PUMP AND MACHINERY CORPORATION

115 BROADWAY, NEW YORK

SNOW-HOLLY WORKS: BUFFALO, N. Y.

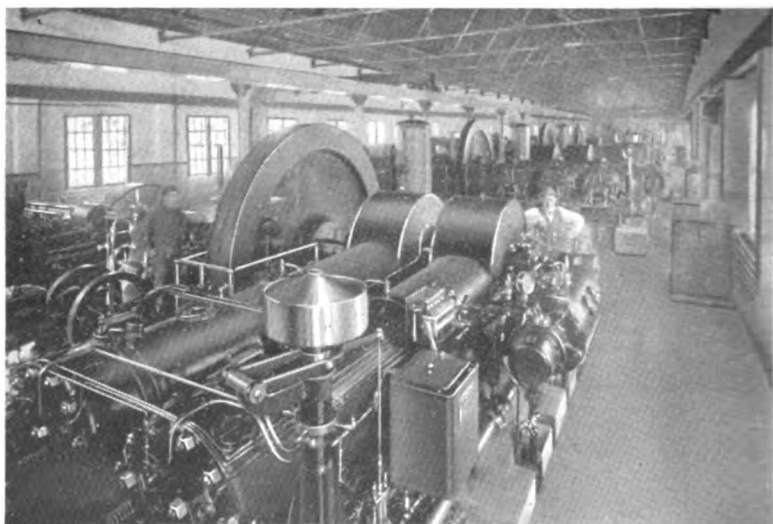
Branch Offices in All Principal Cities

Snow Oil Engines

Snow Oil Line Pumps

Snow Gas Engines

Snow Gas Compressors



THE SNOW OIL ENGINE—A SELF-CONTAINED POWER PLANT

The Snow oil engine is of the four-cycle, single, twin or three cylinder type and operates on the high compression cycle. On account of this latter feature there is no sudden rise in pressure with the result that the wear due to shock is eliminated. The temperature of the compressed air is sufficient to ignite the fuel so that a hot bulb or ignition apparatus of any kind is not required.

We have developed a spray nozzle or atomizer which completely converts into fine spray the heaviest grades of asphalt base crude oils and residuums from the Mexico and California fields as well as the lighter fuel oils and distillates from the eastern and mid-continent fields.

Snow oil engines are simple, reliable, and can be depended upon for continuous service. In their design particular attention is given to accessibility and the reduction of operating attention to a minimum. They are rated conservatively and are subjected to a rigid brake test on our erecting floor before shipment. They are adapted to all power purposes, including belting to generators or line shafts, direct connection to generators for parallel operation, and direct connection to oil line pumps, air compressors or ammonia compressors.

Our standard fuel guarantees, based on crude oil, distillate, or fuel oil of 18,500 B. T. U.'s per pound containing not over 1% of water, are as follows:

.48 lb. per B. H. P. hour at full load.

.50 lb. per B. H. P. hour at $\frac{3}{4}$ load.

.57 lb. per B. H. P. hour at $\frac{1}{2}$ load.

ASK FOR FURTHER DETAILED INFORMATION.

S 244.8

THE JACOBSON ENGINEERING CO.

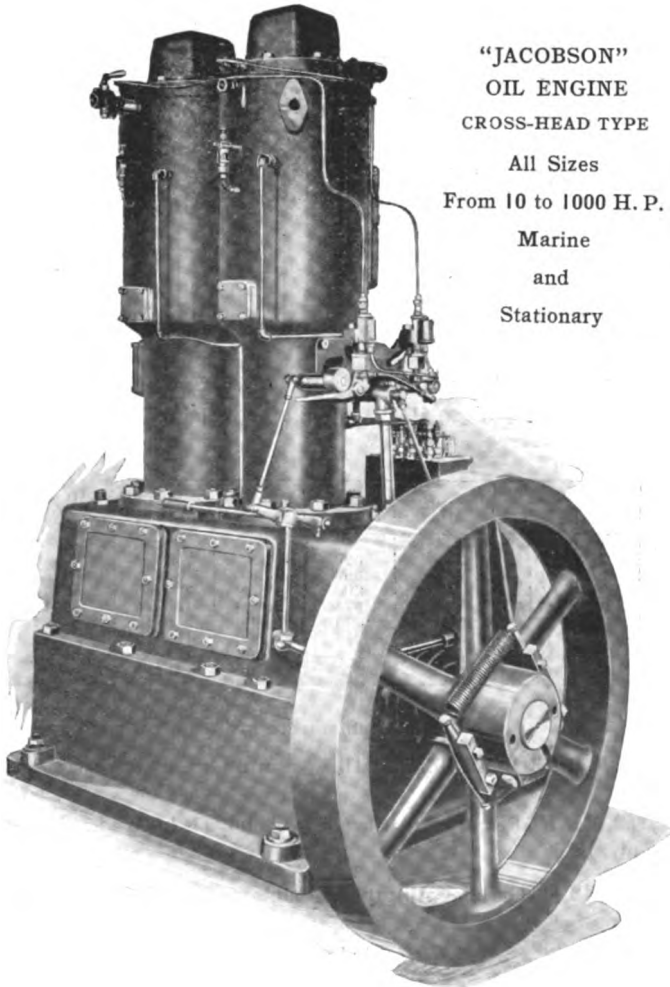
ALBANY, N. Y., U. S. A.

Designers and Manufacturers of Gas and Oil Engines

Standard Units from 10 to 1000 H. P.

Horizontal & Vertical, Marine & Stationary

We are manufacturing Crude Oil Engines of horizontal and vertical types for marine and stationary work; Oil Engines for hoists, winches, dredges, steam shovels and also for direct driven air compressor units; Gas Engines for stationary and marine work; Gas Producer Plants and kerosene attachments that can be put on any kind of gasoline or gas engines for either stationary or marine work. We are also in a position to supply at manufacturers' prices Kerosene Engines suitable for farming work.



"JACOBSON"

OIL ENGINE

CROSS-HEAD TYPE

All Sizes

From 10 to 1000 H. P.

Marine

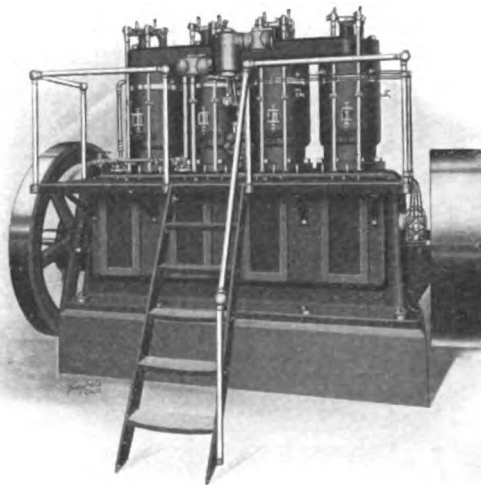
and

Stationary

HOPE ENGINEERING & SUPPLY CO.

TULSA, OKLA. MT. VERNON, O. PITTSBURGH, PA.

Consulting and Contracting Engineers in Natural Gas and Petroleum
Laboratory and Field Tests—Reports



BUILDERS OF REEVES VERTICAL GAS ENGINES

Any Power up to 200 H. P., Natural, Artificial & Producer Gas

LIST

H. P. Nat. Gas	Cylinder			R.P.M.	Shipping Weight	Floor Space	Standard Pulley	List Price
	No. 1	Div.	Stroke					
18	1	9 1/4	11 1/2	300	5800	48x54	24x 8	1530
40	2	9 1/2	11	300	9000	72x58	30x10	2360
60	3	9 1/2	11	300	12500	88x58	36x12	2970
80	4	9 1/2	11	300	17000	104x58	36x14	3900
100	3	11 1/2	13	275	20000	106x76	54x14	4565
135	4	11 1/2	13	275	26000	126x76	54x19	5610
150	4	12 1/4	13	275	28000	128x16		6160
170	4	12 1/2	14	275	36000	144x80	Special	7700
200	4	14	14	275	40000	148x80		9025

Manufacturers of

HAMMON PIPE COUPLER for Oil, Natural Gas, and Water Lines in any Service.

HEAT EXCHANGERS for Treatment of Oil and Gas in Refineries, By-Product Coke Plants, Etc.

ABSORBERS for Gasoline Absorption Plants, Chemical Works, Etc.

Correspondence Solicited.

NATIONAL METER COMPANY

Established 1870

299 BROADWAY

NEW YORK CITY

Manufacturers of Water Meters and Gas Engines

BRANCH OFFICES:

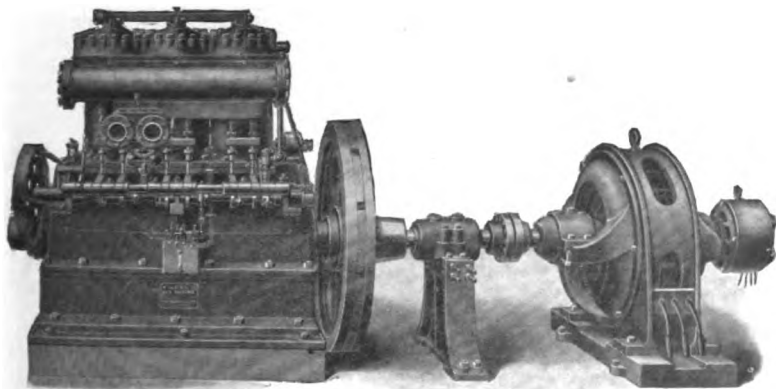
CHICAGO, 1227 Wabash Ave. BOSTON, 159 Franklin St. CINCINNATI, 224 East 4th St.
PITTSBURGH, 4 Smithfield St. ATLANTA, 3d Nat. Bank Bldg. LOS ANGELES, 411 S. Main St.
SAN FRANCISCO, 141 New Montgomery St. WINNIPEG, MANITOBA, 229 Spence St.
LONDON, Caxton House

NASH GAS ENGINES

**To Operate on Illuminating Gas, Natural Gas, Gasoline or Producer Gas
Simple, Silent, and Efficient**

The engine throughout is the embodiment of the latest and best ideas of gas engine design and construction.

Is of very liberal proportions and high grade in every detail. The NASH has many exclusive and valuable features.



All sizes of NASH engines are of the four-cycle type and are fitted with throttling or hit and miss governors as may be selected or best suited to the conditions.

The National Meter Company is the originator of the throttling governor for gas engines and the NASH was the first gas engine to be equipped with it.

In regulation, the NASH Gas Engine is on a parity with that of the best steam engines.

Due to its high economy, closeness of regulation and quietness of operation it meets a great range of power requirements.

Manufactured in all sizes from 25 to 400 H. P.

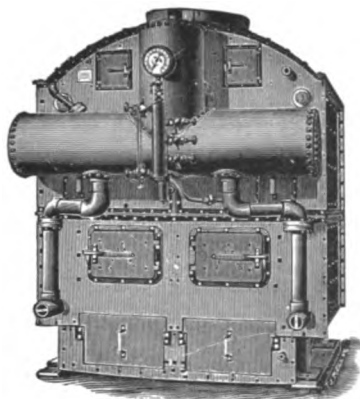


ALMY WATER TUBE BOILER CO.

PROVIDENCE, R. I.

Sectional Water Tube Boilers for Every Marine Purpose

ALMY PATENT SECTIONAL WATER TUBE BOILERS



Exterior—Class B, C, D

34

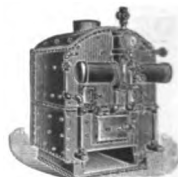
The Almy Boiler is in every respect a Pipe Boiler, being constructed of Extra Strong Iron Pipe and Malleable Iron Fittings. As the threads are standard size, repairs may be made conveniently in almost any part of the world. Due to design, expansion and contraction is entirely taken care of and sudden change of temperature has no bad effect on the heating surface. 75 lbs. to 100 lbs. of steam may be raised from cold water within seven minutes with perfect safety.



Interior
Class A, B, C

We build six classes or types of boilers—A, B, C, D, E and Z. Type is determined according to the desired duty. Sizes run from 2.7 to 56 sq. ft. of grate surface and 87 to 2,000 sq. ft. of heating surface.

An evaporation of 11.92 lbs. of water from and at 212° per pound of combustible has been shown on a 45 H. P. boiler—rate of combustion 14 lbs. per square foot of grate surface per hour. The same boiler under forced draft evaporated 7.89 lbs. of water per pound of coal—gage pressure 153 lbs., feed temperature 56°, rate of combustion 35.98 lbs. of coal per square foot of grate surface per hour.



Exterior
Class A

The large amount of fire-box heating surface receiving direct heat is an important feature. In our Class D and E boilers, there is 90% more of such heating surface than in a flat-sided fire box of equal dimensions.

These boilers are very satisfactory with oil burners as quite a number of installations on the Pacific Coast have proved.

Our business is principally marine but we occasionally furnish boilers for stationary use. "Knocked down" boilers may be shipped in 400 lb. packages and under.

Catalogue containing full description of construction will be sent on application.

THE BASS FOUNDRY & MACHINE CO.

Established 1853

FORT WAYNE, IND.

Manufacturers of Engines, Boilers, Heaters, Steel Plate Work, Rope Wheel Drives, Forgings, Car Wheels and Castings

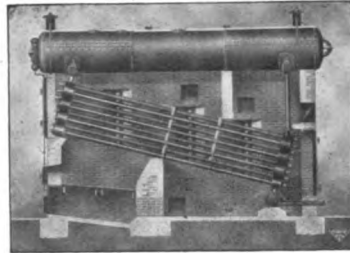
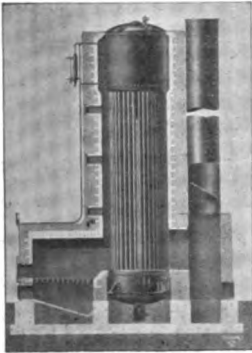


HEAVY DUTY AND GIRDER FRAME CORLISS ENGINES

for

**Factory, Rolling Mill and Direct
Connected Service**

Built in simple, tandem compound and cross compound types.



HORIZONTAL AND VERTICAL WATER TUBE BOILERS

In sizes from 50 to 1000 H. P.

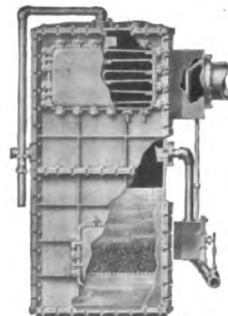


HORIZONTAL TUBULAR BOILERS

SEND FOR A COPY OF

"STEAM POWER"

Which illustrates the different types of Engines, Boilers, Heaters and other power plant equipment which we manufacture.



OPEN FEED WATER HEATERS

**Both Horizontal and
Vertical**

Either cast iron or steel construction.

Built in all sizes.

THE BABCOCK & WILCOX CO.

GENERAL OFFICES:

85 LIBERTY STREET, NEW YORK

BOSTON, 49 Federal St.
 PHILADELPHIA, North American Bldg.
 PITTSBURGH, Farmers Deposit Bank Bldg.
 CLEVELAND, New Guardian Bldg.
 CINCINNATI, Traction Bldg.
 ATLANTA, Candler Bldg.
 NEW ORLEANS, 533 Baronne St.
 HOUSTON, TEX., Southern Pacific Bldg.
 TUCSON, ARIZ., Santa Rita Hotel Bldg.

CHICAGO, Marquette Bldg.
 DENVER, 436 Seventeenth St.
 SALT LAKE CITY, 705-6 Kearns Bldg.
 SEATTLE, Mutual Life Bldg.
 SAN FRANCISCO, Sheldon Bldg.
 LOS ANGELES, I. N. Van Nuys Bldg.
 HAVANA, CUBA, Calle de Aguiar 104.
 SAN JUAN, PORTO RICO, Royal Bank Bldg.

WATER TUBE STEAM BOILERS

Babcock & Wilcox

Stirling

Babcock & Wilcox Marine

Rust

STEAM SUPERHEATERS MECHANICAL STOKERS

Boiler practice has changed materially in the past ten years. Higher pressures and higher superheat have come into every-day practice and with these changes have also come larger units and higher rates of combustion, due to better stokers and furnace arrangement, better methods of feed water treatment, improved coal and ash handling apparatus and a better understanding of the care and operation of boilers. During this period great improvements have been made in the utilization of other fuels than coal. These developments have brought about a change in boiler room design and necessitate a much more careful study of the size of plant, service conditions, fuel, water, and class of boiler room help available.

By reason of the different factors involved the selection of a proper boiler unit is much more complex than in the past. Years ago this Company manufactured a line of so-called "standard" boilers; while these standards are still in existence, the sale of a standard boiler today is a rarity, for the reason that operating conditions cannot be even approximately standardized. Each and every prospective boiler sale is approached by this Company as an entirely new and independent engineering problem, the various factors involved determining the particular type, size and setting of boiler offered.

A very brief description of the different types of boilers manufactured by this Company is given on the following pages.

THE BABCOCK & WILCOX CO.

THE BABCOCK & WILCOX BOILER

The heating surface of the boiler is made up of drums extending longitudinally over the other pressure parts. To the drums there are connected, through forged-steel cross boxes at either end, the sections made up of headers and tubes. At the lower end of the sections there is a mud drum extending entirely across the boiler and connected to all of the sections. The connections between all parts are made by short lengths of tubes expanded into bored seats.

The headers into which the tubes are expanded are of forged steel and are of serpentine or sinuous form so that the tubes are disposed in a staggered position when assembled as a complete boiler. This staggering of the tubes breaks up the gases and causes them to impinge on every tube.

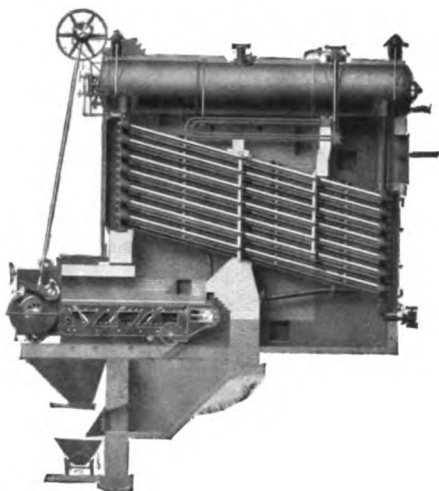
Opposite each tube end in the headers there is placed a handhole of sufficient size to permit the inspection, cleaning or renewal of a tube. These handholes are closed by suitable handhole fittings.

The gases of combustion are caused to make three passes over the heating surfaces by baffles constructed of special baffle brick and cast-iron flame plates.

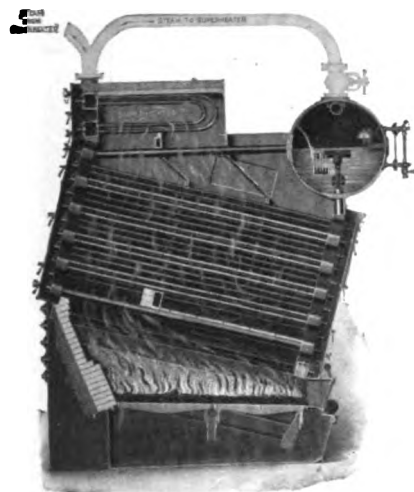
The form of the furnace is such that it is readily adaptable to the fuel available, whether solid, liquid or gaseous.

Boilers are suspended front and rear from wrought-steel supporting frames, entirely independent of the brickwork.

Patented dusting doors furnish a means of keeping all portions of the heating surfaces free from soot and dust. Large doors in the sides of the setting give full access to all parts for inspection and for the removal of any accumulation of soot.



THE BABCOCK & WILCOX MARINE BOILER



The Marine Type of Babcock & Wilcox boiler preserves the excellent features of the Land Type but adapts them to the conditions on shipboard. The tubes are usually of smaller diameter and are shorter than in the Land Type. The furnace increases in volume toward its exit and with its tile roof gives highly efficient combustion. The flame plates or baffles and the staggering of the tubes give the heating surface an efficiency unobtainable in any other boiler.

All parts subject to pressure are made of the highest quality of forged steel. No castings are used. The parts are as thick or thicker than the corresponding parts in cylindrical or Scotch boilers. The weight of the boiler, however, is less than one-half that of Scotch marine boilers for pressures above 200 pounds. There are Babcock & Wilcox marine boilers which have been in service for more than fifteen years which are still using the original tubes.

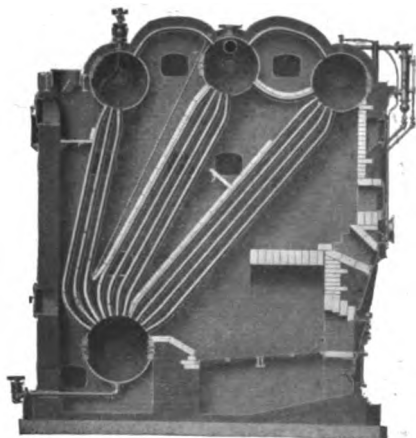
The Babcock & Wilcox marine boiler is especially adapted to the use of oil fuel. Where oil is burned, practically the entire surface of the furnace is composed of fire-brick, insuring perfect combustion.

(Continued on next pages)

(Continued from preceding pages)

THE BABCOCK & WILCOX CO.

85 LIBERTY STREET, NEW YORK

**THE STIRLING BOILER**

The Stirling boiler consists of three transverse steam and water drums set parallel and connected to a mud drum by three banks of water tubes so curved as to enter the drums radially. The steam space of the center drum, from which steam is taken, is connected to the front and rear drum by steam circulating tubes and to the front drum by water circulating tubes.

The tubes are so spaced as to allow the removal of any tube without disturbing any other tube or the brickwork.

The furnace is formed by the use of a firebrick arch sprung across the boiler setting in the triangular space formed by the front wall and the front bank of tubes. This furnace readily lends itself to the installation of any stoker and the burning of any class of fuel.

The gases of combustion are led from the furnace over the heating surface by two baffles of firebrick tile, one resting on the rear row of tubes of the front bank and the other supported on the rear row of tubes of the second bank.

The boiler is supported on a wrought iron framework entirely independent of the brickwork setting.

Large cleaning doors in the sides of the setting give ready access to all portions for cleaning, inspection and repair.

THE RUST BOILER

The Rust boiler is made up of two transverse steam and water drums and two transverse mud drums connected by banks of tubes. Each steam drum is connected to the mud drum directly below it by five rows of straight tubes and one row of curved tubes. The steam drums are connected by curved steam and water circulating tubes and the mud drums by water circulating tubes.

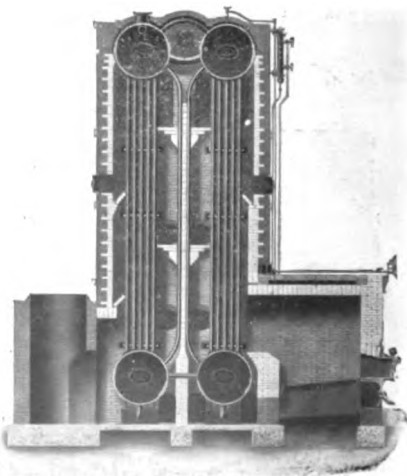
The tube sheets of all drums are pressed to form individual tube seats, thus permitting straight tubes to be expanded directly into the cylindrical drums. This construction is patented.

The tubes are staggered and are so arranged that any tube may be removed without disturbing any other tube or the boiler brickwork.

The furnace is of the extension or Dutch oven type and being distinct from the boiler setting proper, enables any type of furnace or any fuel to be used.

The gases are caused to make two passes over the heating surface by a vertical firebrick baffle built between and held in position by the central curved tubes. Horizontal baffle shelves cause all portions of the heating surface to be swept by the gases.

The boiler is supported entirely free of the brickwork on cast-iron saddles under the mud drums, the saddles resting on masonry foundations.

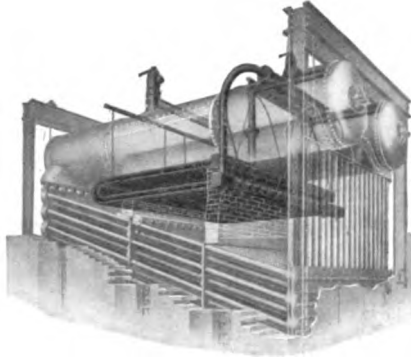


THE BABCOCK & WILCOX CO.

THE BABCOCK & WILCOX STEAM SUPERHEATER

The Babcock & Wilcox superheaters, as built for installation in all boilers of The Babcock & Wilcox Co's manufacture, are similar in design, location and operation. The construction is modified in certain details to meet the specific requirements of individual boilers.

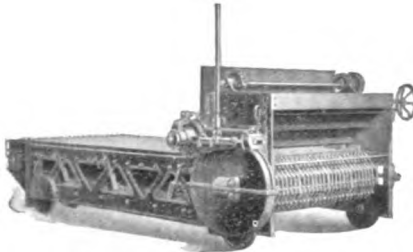
The superheater consists of two headers or manifolds, into which tubes bent to a U-shape are expanded. These headers are equipped with handholes and forged-steel handhole fittings, giving access to each tube end. As there is no rigid connection between the headers and because of the proper methods of suspension, there can be no strains set up in the apparatus by contraction or expansion. Each superheater is equipped with an independent steel-bodied, outside-spring, safety valve.



The superheater in all cases is located in the direct path of the products of combustion. The surfaces presented to these gases are smooth, offer the minimum resistance to the passage of the gases and the least opportunity for the adhesion of dust.

Steam is taken from the steam space of the boiler through the dry pipe, is introduced into the intake header and passes through the superheater tubes to the outlet header, to which the superheated steam connection from the boiler is made.

THE BABCOCK & WILCOX CHAIN GRATE STOKER



The Babcock & Wilcox chain grate stoker consists of a grate in the form of an endless chain passing at the front and rear of the boiler furnace over sprockets which are keyed to shafts carried by the stoker frame. The passage of the grate through the furnace is continuous. The stoker is driven through a worm wheel keyed to the front sprocket shaft. The fuel is fed uniformly to the front end of the grate under an adjustable stoker gate. The volatile gases are driven off on the forward portion of the grate under an ignition arch and are completely consumed in passing over the incandescent fuel bed before striking the boiler heating

surface. Combustion is truly progressive. The ash and refuse are discharged automatically and continuously as the grate turns over the rear sprockets.

The form of the grate links is such as to allow proper admission of air for combustion. Suitable side seals and a bridge wall water box prevent the admission of large quantities of excess air. The bridge wall water box is connected into the water circulation of the boiler and is part of the regular stoker equipment.

The construction of the entire stoker is of such rugged character throughout as to permit continuous operation without the necessity of shut-downs for repair.

This stoker will only be offered for installation where fuel suitable for chain grate stoker[®] is available.

Over 24,000,000 horse power of boilers manufactured by The Babcock & Wilcox Co. are in use throughout the world.

The Babcock & Wilcox Co. publishes the following books: "Steam," "Marine Steam," "The Stirling Water Tube Boiler," "The Rust Water Tube Boiler," "Steam Superheaters," and "Chain Grate Stokers," any of which may be obtained upon application to the nearest of the Company's branch offices.



THE BIGELOW COMPANY

WORKS AND MAIN OFFICE

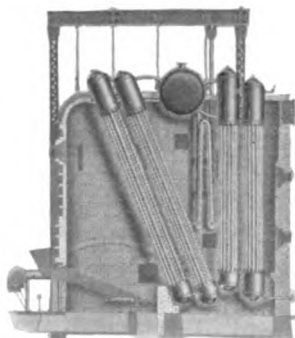
76 RIVER ST., NEW HAVEN, CONN.

NEW YORK OFFICE, 85 LIBERTY ST.

BOSTON OFFICE, 141 MILK ST.

SOUTHEASTERN OFFICE, Realty Building, CHARLOTTE, N. C.

**Manufacturers of Fire Tube and Water Tube Steam Boilers,
Heavy Plate Steel Work**



Bigelow-Hornsbly Boiler

THE BIGELOW-HORNSBY WATER TUBE BOILER

Some of the features of the Bigelow-Hornsbly Boiler that meet the requirements of Modern Power House Practice:

- Unlimited size of units.
- Small ground space occupied.
- Coldest water meets the coldest gases.
- Direct heating surface about four times as great as the average water tube boiler.
- All parts, both external and internal, readily accessible.
- All boiler tubes perfectly straight.
- Circulation of water and liberation of steam unrestricted.
- Very dry steam, also ample room for superheaters where required.
- High continuous economy due to extreme cleanliness of the most efficient heating surface.
- Arrangement of baffling is such that the gases pass over the heating surface in thin streams and uniformly at every point.
- Furnace arrangement is ideal for securing perfect combustion, as furnace is correctly shaped and of ample size.

Greatest flexibility, both as to construction and in steaming qualities.

No cast iron used in any portion of the boiler proper.

Constructed both as to workmanship and material in accordance with the most advanced boiler practice.

40



Bigelow-Manning

THE BIGELOW-MANNING BOILER

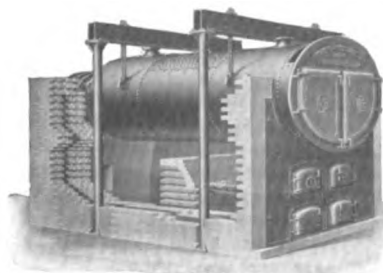
This type of boiler can be constructed suitable for 200 pounds working pressure or more, in units up to 500 H. P. The shell sheets being away from contact with the fire permits the use of any thickness of shell necessary for high pressures. Another feature conducive to safe operation is the firm support of the boiler, which is accomplished in the Bigelow-Manning type by having a firm foundation upon which the cast iron base rests, without relying upon the support of setting walls.

The economical evaporative performance of the Bigelow-Manning Boiler is remarkable. All radiant heat from the fuel bed is absorbed directly by water-heating surface, the distribution of the furnace gases over the heating surface is practically uniform, the superheat furnished is varied by changing the water level, there are no losses due to the infiltration of air in the setting and stand-by losses are comparatively small, occupying per H. P. much less ground space than other types.

HORIZONTAL RETURN TUBULAR BOILER

The advantages of compactness and efficiency, large direct heating surface, easy cleaning, large liberating surface, perfect circulation and minimum liability and ease of repairs are well-known features of this type.

Our boilers are constructed in the most approved manner; we adopt the very highest type of professional and mechanical service, maintain the highest possible standard of efficiency, and believe our facilities for boiler construction are without a parallel.



Suspension Type of H. R. T.

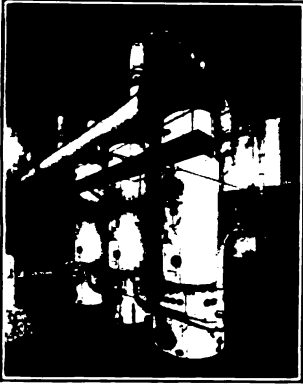


R. D. COLE MANUFACTURING CO.

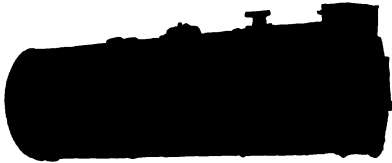
Established 1854

NEWNAN, GEORGIA

Manufacturers of Boilers, Engines, Elevated Tanks, and Steel Plate Work

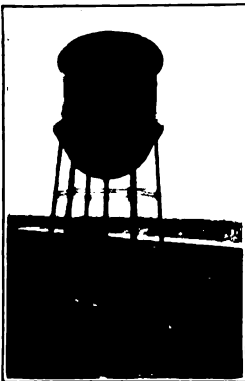


COLE-MANNING BOILER.—This type boiler is constructed in units up to 400 horse power and for pressure of 200 lbs. or more. Boiler shell is supported on a one-piece cast iron base, which can be fitted with stationary or shaking grates. Smoke box provided with removable cast iron cover and provided with connection for all standard soot-cleaning devices. The evaporative performance, super-heating qualities and small floor space per horse power, contribute to make this type boiler a most desirable and economical unit.



HORIZONTAL RETURN TUBULAR BOILER.—These boilers are constructed in a most approved manner and of materials in full accordance with the A. S. M. E. Code. Standard settings can be provided with stationary or shaking grates and where

increased efficiency and compactness is desired, standard steel casings can be provided for these settings. These boilers are designed with liberal proportions of heating surface, steam space and grate area, and within the limits of their usefulness are unsurpassed as steam generators. These boilers are constructed in units up to 250 horse power and for steam pressure of 200 lbs. per square inch.



ELEVATED STEEL TANKS.—Special designs for steel sprinkler tanks or domestic service will be furnished by our Engineering Department. Our elevated tanks are correct in design and the simplicity of the structure contributes to its low cost of maintenance. Sprinkler tanks and equipment are designed to incorporate the recommendations of all insurance authorities. Our facilities provide for the design and construction of all forms of steel plate work, including STACKS, ACID TANKS, PRESSURE VESSELS, STRUCTURAL FRAMES AND TOWERS.

THE CASEY-HEDGES CO.

Founded 1889

CHATTANOOGA, TENN.

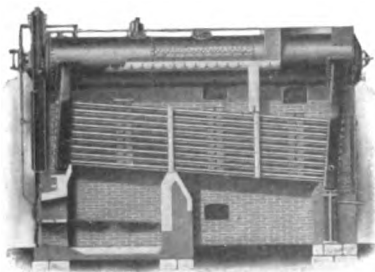
CHICAGO
MEMPHIS
DALLAS

NEW ORLEANS
SEATTLE
HAVANA, CUBA

NEW YORK
BIRMINGHAM
SAN JUAN, P. R.

Manufacturers of All Types of Boilers and Plate Metal Work

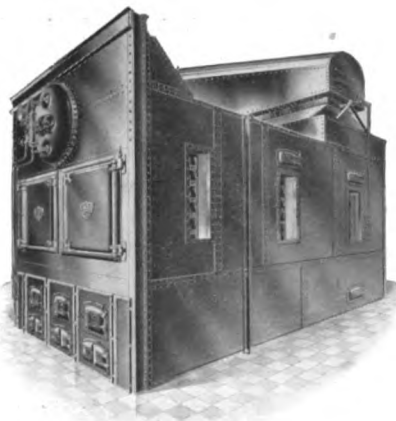
Boilers built in accordance with A. S. M. E. Code when desired.



**C-H Horizontal Water Tube Boiler,
Vertical Baffle**

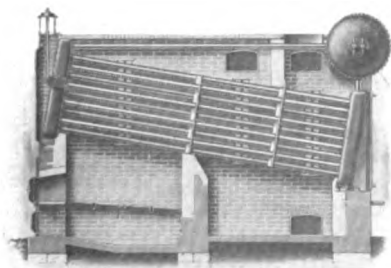
C-H HORIZONTAL WATER TUBE BOILERS

All steel construction. Built in units from 75 to 1000 H. P. Oval handholes with machined surfaces. With either Horizontal, Vertical or Combination Baffles. Large areas through water legs permitting rapid circulation. Boiler supported free from brick work by wrought steel supporting frame at front end; the rear by columns with expansion saddles and rollers.



C-H HORIZONTAL WATER TUBE BOILERS WITH STEEL CASED SETTING

This type of setting entirely overcomes the defects of the brick setting, which consist chiefly of air leaks due to expansion and contraction; also reduces maintenance cost and decreases cost of foundations. Steel casings may be applied to either the Horizontal or Vertical Baffle types. The steel casing may also be used in conjunction with stokers.



C-H Cross Drum Water Tube Boiler

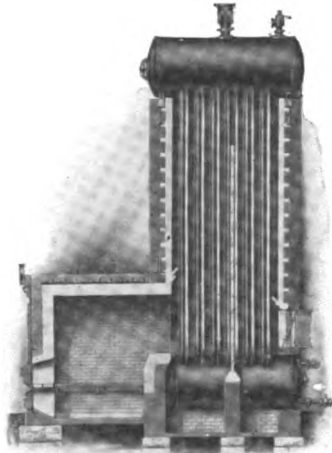
C-H CROSS DRUM WATER TUBE BOILER

Especially suitable for installations where head room is restricted, such as basements and office buildings. Boiler is of sectional construction; may be shipped knocked down and parts taken through small openings. Built in sizes from 75 to 600 H. P.

THE CASEY-HEDGES CO.

C-H VERTICAL WATER TUBE BOILER

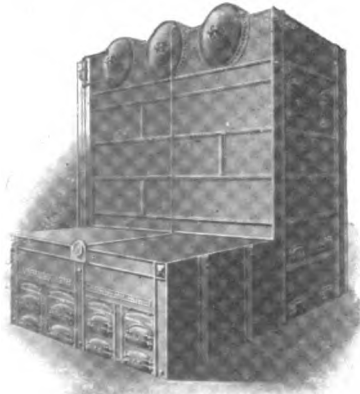
This boiler is of simple construction and very efficient. Consists of one or more upper drums, connected to one or more lower drums by a series of tubes placed in staggered rows. Baffles are set vertically in boiler and may be arranged for either two or three passes of the hot gases through the tube heating surface. Tubes enter drums radially, and are curved to an easy radius. Boiler is of unit construction; therefore, the size is unlimited. Furnace is of Dutch Oven construction.



C-H Vertical Water Tube Boiler

C-H VERTICAL WATER TUBE BOILER WITH STEEL CASING

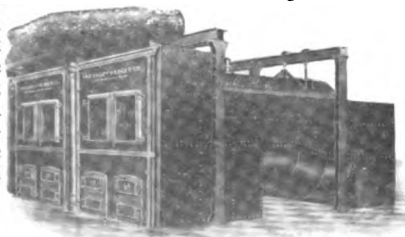
The C-H Vertical Water Tube Boiler is an ideal boiler when steel encased. A special design of steel casing is used, built in sections. Each section is provided with tie bar lintels that hold the wall in place, preventing buckling or bulging inward of the brick work. It is unnecessary to discuss the value of the steel casing, as it is well known.



C-H Vertical Water Tube Boiler
with Steel Casing

C-H HORIZONTAL RETURN TUBULAR BOILER WITH STEEL CASING

We originated the steel cased type of boiler setting, and have perfected three well-known types; viz., Standard, Full Dutch Oven and Semi-Dutch Oven. Steel Casing construction of heavy steel and braced with angles. Will save 33⅓% in brick work and 60% in foundations. The steel setting is absolutely air-tight; does away with expansion leaks in brick work; has practically no maintenance cost; assembled complete before shipping; may be installed by a novice.



C-H Steel Casing for Tubular Boilers



Catalogue of the Casey-Hedges' Products Will Be Furnished on Application.

D. M. DILLON STEAM BOILER WORKS

Established 1870

Incorporated 1906

MAIN OFFICE AND WORKS: FITCHBURG, MASS.

NEW YORK OFFICE
30 Church Street

SOUTHERN REPRESENTATIVE
J. S. Cothran, Charlotte, N. C.

BOILERS

We are equipped to furnish

For high pressure service, 150 to 200 lbs. working pressure; all fire tube types such as Horizontal Tubular, Straight Upright, Manning Upright, Locomotive and Marine.

STACKS

Guyed and Self-Supporting, any diameter and height.

TANKS

Any capacity, type, pressure or vacuum.

ROTARY KIERS

Special construction for all classes of work.

KIERS

Special construction for any class of work, high or low pressure.

VULCANIZERS

Special construction for various classes of work.

BOILER TUBES

All standard sizes; safe ending old tubes a specialty.

SMOKE FLUES

For any size or type of boiler, any thickness of material.

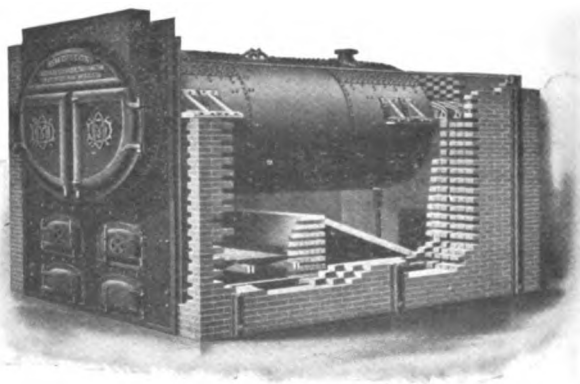
PLATE WORK

All kinds.

High Pressure Boilers and Large Units.—To meet the increasing demand for higher pressures and larger units, we have gone carefully into the matter of thick shell plates and have found that when used in boilers of proper design and construction, they are perfectly reliable in every way.

We have built many horizontal return tubular boilers for 200 lbs. working pressure using shell plates $\frac{3}{4}$ " thick, planed down to about $\frac{1}{2}$ " at the girth seams, and the years of satisfactory service they have given prove that our contention as to the use of thick plates is correct; also that our design and construction methods are the best.

We build horizontal return tubular boilers in units from 10 horse power (24' diam.) to 600 horse power (108" diam.).



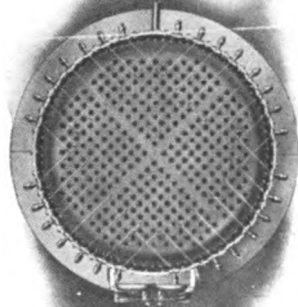
Horizontal Return Tubular Boiler

Illustration shows all steel boiler (nozzles, brackets, manhole covers, yokes, etc., all of steel) set with full overhanging steel front of special design. Note the tie rods above and below fire line; also stiffeners to prevent warping.

D. M. DILLON STEAM BOILER WORKS

MANNING BOILERS

The Manning type of upright boiler (see cut) is perfectly adapted to all the requirements of the highest pressures and the largest units, because no plate subject to tensile strain comes in contact with the fire. It is the best boiler for turbines on account of its ability to furnish steam superheated 25 to 50°; the amount of superheat may be increased by lowering the water line or by using longer tubes.



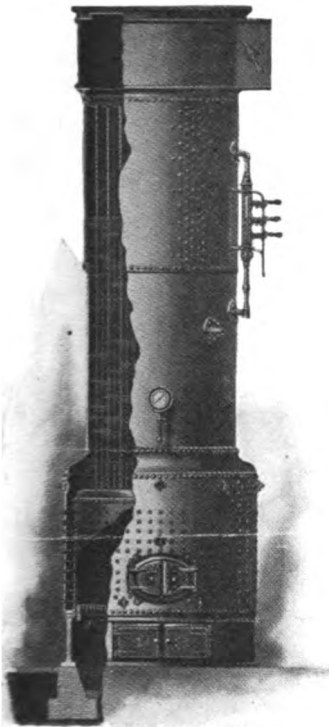
Horizontal Section of Manning Boiler, Showing Multiple Plan of Handholes

45

It is well suited for any locality regardless of water conditions when made with the multiple plan of cleaning handholes which give access to every part of the crown sheet (see cut). The outside furnace plate is sometimes carried a little higher and a 12" x 16" manhole placed opposite the crown sheet, thus providing additional facilities for cleaning and internal inspection.

This boiler being self-contained, requires no brick setting; consequently the expense of maintenance is low, and the efficiency is uniformly high.

We build Manning boilers in sizes from 50 horse power to 500 horse power for any working pressure.



Manning Boiler, Showing Elevation and Section and Solid Cast Iron Base upon Which It Sets

EDGE MOOR IRON COMPANY

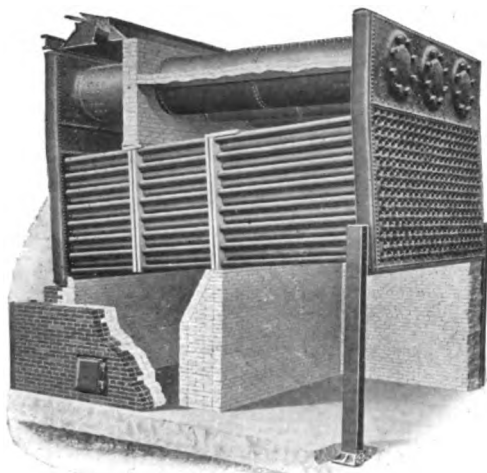
EDGE MOOR, DELAWARE

NEW YORK
111 Broadway

BOSTON
79 Milk Street

CHICAGO
10 S. La Salle Street

Manufacturers of Edge Moor Water Tube Boilers

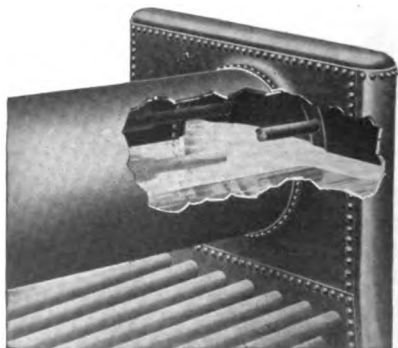


Note the special header construction, the horizontal drums, the elliptical handholes, the steel supports, and the efficient manner of baffling

When a boiler is desired for the exacting service of a modern power plant, the square feet of heating surface and the strength of parts are not the only important factors to be considered. While a boiler appears to be a simple piece of apparatus structurally, its internal performance is far more complex than is generally realized, and it is this complex action that warrants more attention to the details of design.

The special features of the Edge Moor boiler cannot be explained in the limited space of an advertisement. Those interested in steam boilers and in tests of unusual performance should send for our illustrated bulletins. They will also do well to ask for preliminary information from one of our sales offices before preparing the final specifications for a proposed plant, for by doing so, they will obtain valuable suggestions without any obligation.

Edge Moor boilers are built in sizes from 100 to 1000 horse-power.



The header construction provides such an increased steam-liberating area that boilers can be safely and efficiently forced to several times rated capacity



Write our nearest office.

THE FROST MANUFACTURING CO.

Established 1851

WORKS

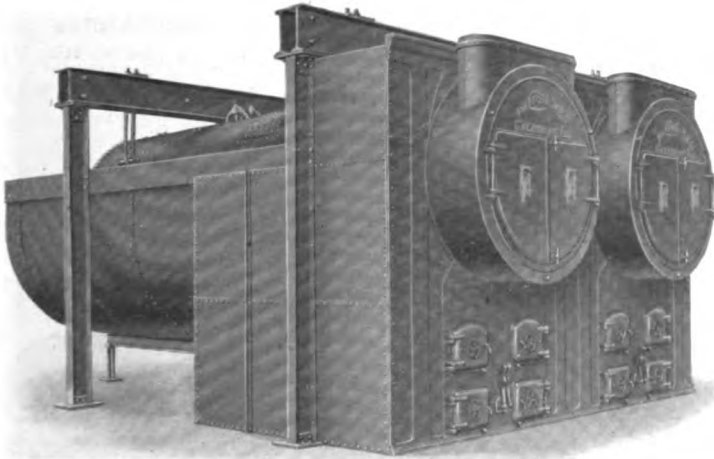
GALESBURG, ILL.

GENERAL SALES OFFICE

112 W. ADAMS ST., CHICAGO, ILL.

Manufacturers of Steam Engines; Horizontal, Tubular, Vertical, and Fire-Box Boilers; Open and Closed Feed-Water Heaters and Purifiers; Tanks, Air Receivers, Special Plate Work, Etc.

THE *Frost* RETURN TUBULAR BOILERS



47

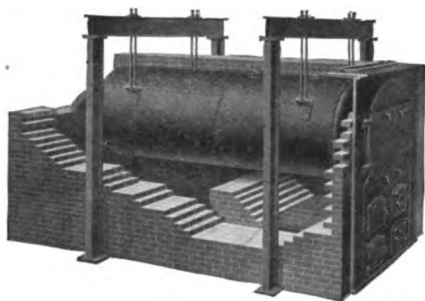
Our Horizontal Return Tubular Boilers are built to the requirements of the A. S. M. E. code in sizes up to 84" diameter and for working pressures allowed by the code. All castings are made in our own foundry insuring the necessary grade of iron for the work. Exceptional drilling and plate planing facilities allow us to build for the highest pressures and the largest diameters.

Our Vertical Boilers are regularly built in sizes up to 60 H. P. and Fire-Box Boilers to 150 H. P.

THE HOUSTON, STANWOOD & GAMBLE COMPANY

CINCINNATI, OHIO

Manufacturers of Steam Engines and Boilers



Boiler with Full Flush Front and Suspension Apparatus

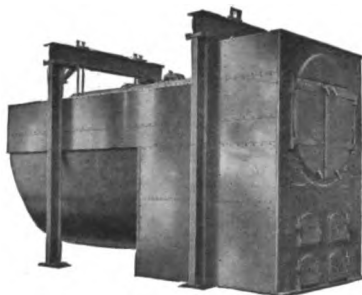
the maintenance expense through largely avoiding the necessity of repairs to the brick work, the brick lining being held rigidly in place by the steel jacket. The style of steel casing illustrated is only one of the many designs of steel casings built by us.

HORIZONTAL TUBULAR BOILERS

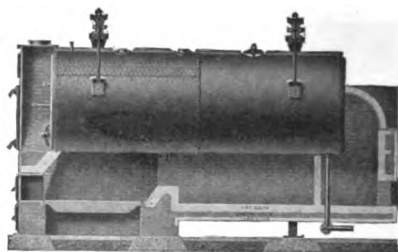
We build all sizes of Horizontal Tubular Boilers up to 84"—20'—250 H. P. The 72", 78" and 84" diam. boilers in the 18' and 20' lengths are the most popular sizes and are also most efficient in respect to first cost per H. P. and operating efficiency. We especially recommend The American Society of Mechanical Engineers' Boiler Code to prospective purchasers as the boiler specifications contained therein embody good boiler practice.

STEEL CASINGS

The steel casing boiler setting is a steel jacket for the brick work which secures an improvement in the economical performance of the boiler plant through almost entirely eliminating air leakage through the walls; also greatly reduces



Steel Casing Boiler Setting with Flush Front

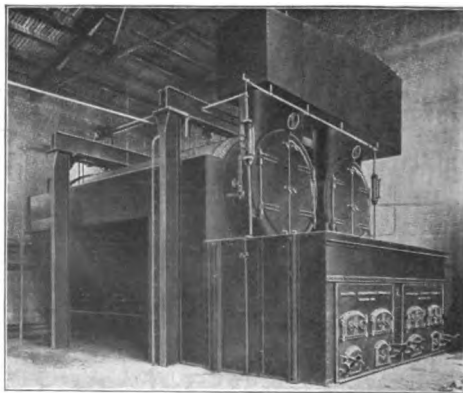


Sectional View Steel Casing Setting

The sectional view shows the relation of the brick lining and the insulating lining, the latter being placed immediately inside the steel plates of the casing. Through the use of insulating lining, such as diatomaceous earth, asbestos or other suitable material, the common brick ordinarily employed are almost entirely dispensed with, thus reducing radiation loss, the space occupied, the total weight and the amount of fuel required for raising steam when starting.

Illustration at right shows a battery of two boilers having steel casing settings. This installation happens to be equipped with dutch ovens for burning low-grade, high-volatile bituminous coal.

We also build locomotive firebox portable boilers, feed water heaters, smoke-stacks, heavy tanks, stills and do a wide range of similar work.

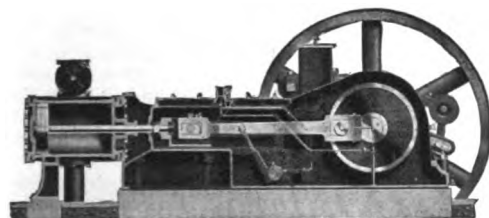


Installation of Two Boilers with Steel Casings

THE HOUSTON, STANWOOD & GAMBLE COMPANY



Completely Enclosed Automatically Oiling Engine
with Shaft Governor



Sectional View

There is a considerable demand for a high-grade completely enclosed automatically oiling engine for direct connection to rotary pumps, fans, blowers, etc. For this class of service it is frequently preferable to operate the engine under control of the throttle or with a limit-speed throttling governor. When this is the case it is often desirable to have a hand adjustment for varying the cut-off (illustrated herewith). We also similarly equip center crank engines when preferred.

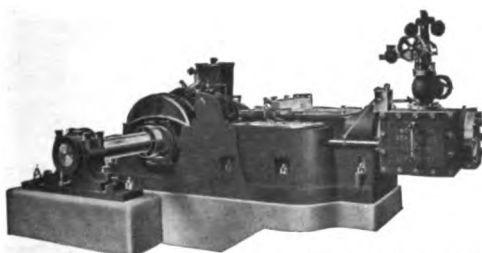
OPEN TYPE ENGINES

Open type Engines of the side crank style are built by us with single cylinder with capacities up to 350 H. P. or with twin cylinders up to 700 H. P. We build open type engines both simple and compound and equipped with either throttling or shaft governors. We build center crank open type engines up to about 100 H. P. The illustration shows a large size twin engine of about 500 I. H. P. Such attachments as link motion, gearing, hoisting drums, etc., are frequently furnished by us.

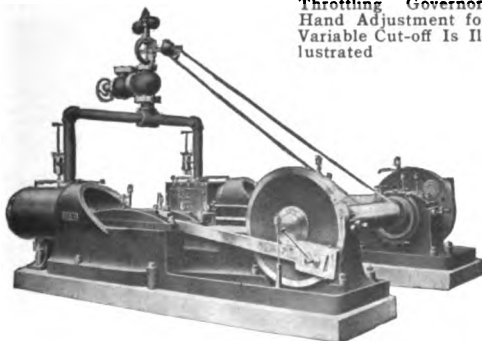
AUTOMATICALLY OILING ENGINES

We build completely enclosed, Automatically Oiling Engines with single cylinder in sizes up to 300 I. H. P. or in twin or cross compound styles, up to proportionately larger ratings. It will be noted that while all of the moving parts are readily accessible, yet even the valve gear is enclosed in such a way as to permit the bearings of the valve gear to be flooded with oil in the same manner as the other bearings are lubricated. Our line of enclosed engines includes the side crank style as illustrated, also includes the center crank style.

The sectional view will make clear our system of lubrication. The lubricating system is so designed that the piping is completely enclosed within the bed plate, so that it does not have to be shipped separately and attached at destination.



Completely Enclosed, Automatically Oiling Engine with
Throttling Governor.
Hand Adjustment for
Variable Cut-off Is Illustrated



Heavy Duty, Open Style Twin Engine, with Throttling
Governor

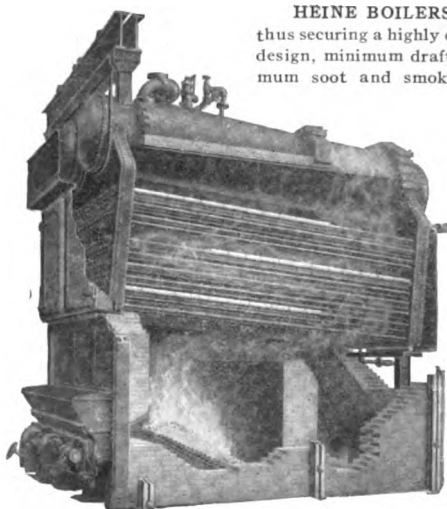
HEINE SAFETY BOILER COMPANY

ST. LOUIS, MO.

PHOENIXVILLE, PA.

NEW YORK BOSTON PITTSBURGH PHILADELPHIA CINCINNATI CHICAGO NEW ORLEANS
SHOPS: ST. LOUIS, MO., AND PHOENIXVILLE, PA.

Manufacturers of Heine Safety Water Tube Boilers, Heine Steam Superheaters, Steel Stacks, Housings, Flues, Etc.



Two Pass Heine Design in Large Size and for High Capacity Stokers

HEINE BOILERS ARE HORIZONTALLY BAFFLED thus securing a highly efficient furnace, compact structure, simple design, minimum draft, minimum resistance to gases, and minimum soot and smoke. Cleanliness is assured because of a permanently installed soot cleaner.

We would be glad to direct you to comparative tests made by the Bureau of Mines and other authorities proving the correctness of the Heine method.

HIGH POWER—HIGH EFFICIENCY SMALL FLOOR SPACE

The Heine Boiler meets these three important requirements of modern boiler practice very nicely. Owing to the construction of the Heine boiler with $3\frac{1}{2}$ ' tubes arranged on symmetrical centers, the area of the flues per sq. ft. of floor space is many times that in ordinary water tube boilers. There is ample circulation allowing the boilers to be forced to high capacity.

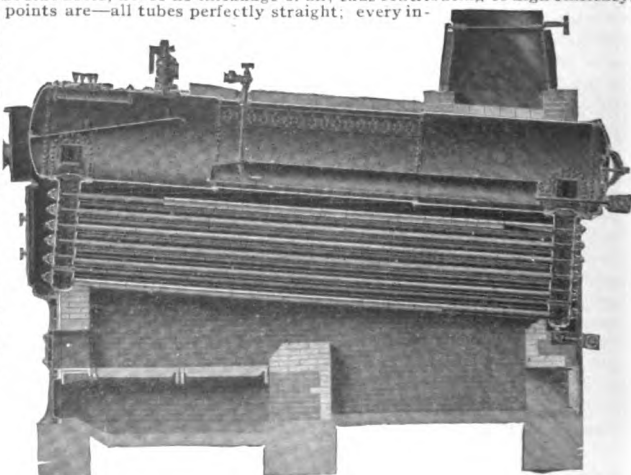
Heine boilers have long horizontal passes and a long path for the gases thus assuring high heat transmission efficiency. Baffles along the lower row of tubes improve the furnace, so that the

combined boiler and furnace efficiency is well up to 80%.

Furthermore, horizontal baffling permits no limit to the number of tubes high in a given boiler. Less head room is required. Side alleys between boilers are not needed except as required with certain types of stokers so that any number of boilers may be set in a battery. In any case there are no side doors, hence no leakage of air, thus contributing to high efficiency.

Other important points are—all tubes perfectly straight; every internal and external part easily accessible; excellent provision for dry steam; provision for expansion and contraction is perfect; quality and construction far in advance of requirements as laid down by the A. S. M. E. boiler code committee.

For complete information regarding modern boiler practice and efficiency of the Heine boiler, send for "Boiler Logic" and "Superheater Logic."



Single Pass Heine Design in Smaller Sizes

E. KEELER COMPANY

Established 1864

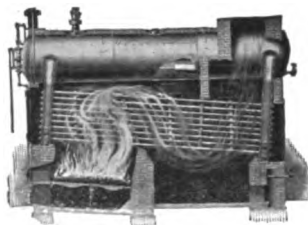
WILLIAMSPORT, PA.

NEW YORK BOSTON PHILADELPHIA PITTSBURGH CHICAGO RICHMOND
 TOKEDO SAN FRANCISCO PORTLAND, ORE. CLEVELAND

Manufacturers of Water Tube and Tubular Boilers. Steel Plate Work

KEELER WATER TUBE BOILERS

Standard Type: The arrangement of furnace, tubes, headers and drum in the Keeler Water Tube Boiler is efficient, accessible and compact. The superior efficiency of the Keeler Boiler rests upon correct proportions of heating and grate surface for the character of fuel to be burned, ample height of furnace, a superior arrangement of baffle walls and a perfect circulation. Every portion of the heating surface is accessible for both external and internal inspection, making it impossible for soot or scale to accumulate undetected. There is ample room between tubes and drum for inspection or repairs. Special side cleaning doors make it possible to observe the condition of the outside surface of the tubes. There is no part of the interior surface that cannot be examined and cleaned.



Standard Type Water Tube Boiler

Keeler Water Tube Boilers are usually built complete and tested in the shop. This reduces the cost of erection, as the boilers are handled as a unit. It also eliminates the dangers due to careless assembling of boilers in the field and makes the erection merely a matter of placing in position and attaching fittings.

Built in units 75 to 1500 H. P.

Cross Drum Type: The Keeler Cross Drum Water Tube Boiler is a modification of the standard design, only in the length and location of the drum and the method of connecting it to the headers. This type was developed to meet the demand for a high pressure water tube boiler that could be installed in Office Buildings, School Houses, Churches, Apartment Houses, Hotels and boiler rooms generally where ceiling height is limited or where the boiler must be introduced through narrow passageways or restricted openings.



Cross Drum Type Water Tube Boiler

The pressure parts of the boiler are shipped in a knocked-down condition, making it possible to install it without cutting through walls and floors in locations that would be wholly inaccessible for almost any other type of boiler. If boilers are to be exported, the cross drum boiler can be handled at much less expense by steamship companies on account of its reduced bulk in a knocked-down condition, and the comparatively small weight of the heaviest piece.

Built in units 60 to 1000 H. P.

KEELER HORIZONTAL RETURN TUBULAR BOILERS

Our return Tubular Boiler is the product of fifty-four years' experience of boiler building. Tube holes are drilled from the solid plate, and not punched small and reamed to size. All seams are thoroughly caulked on the outside, and the end of butt straps are caulked on the inside. Braces are drop-forged. Steam and safety valve outlets are provided with wrought steel connections of an approved type. Manhole plates, yokes and brackets are of pressed steel. All boilers built to A. S. M. E. requirements.



Horizontal Return Tubular Boiler

FIFTY-FOUR YEARS OF BOILER BUILDING

Ask for Catalogs

THE GEORGE T. LADD CO.

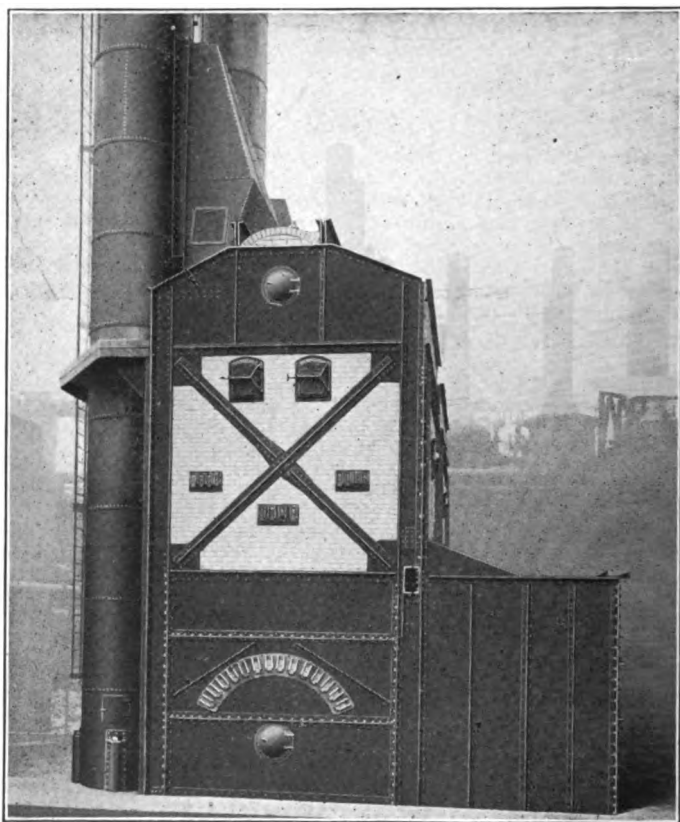
GENERAL OFFICES

1620 FARMERS BANK BLDG., PITTSBURGH, PA.

Manufacturers of the LADD Water Tube Boiler

LADD
WATER TUBE BOILER

PATENTED—OTHERS PENDING



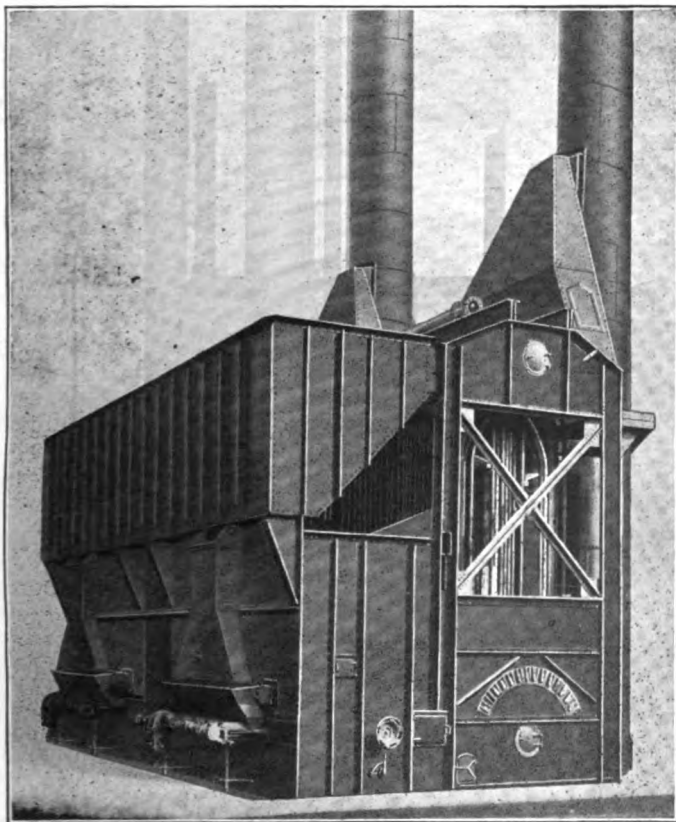
500 Horse Power Boiler with Stack Attached to Boiler Suspension

The LADD Water Tube Boiler is of special interest to purchasers who are in search of apparatus having high operating efficiency and low cost of upkeep. It has been standardized and designed particularly with these two points in view and an examination of its substantial construction will convince the engineer of the lasting and efficient qualities of the LADD type of setting. It can be built in any size up to 3000 H. P. in a single setting, to suit any service and to fit varying space requirements.

THE GEORGE T. LADD CO.

The boiler is built either with the Dutch oven or high arch type of setting, dependent upon the type of stoker, degree of overload required, etc. All tubes are bent to same radius, easily removable (no handhole plates) and arranged in staggered rows.

All brick are standard and the setting so designed that it is unnecessary to use cut brick. The brickwork construction eliminates all possibility of air leaks or cracks. The suspension is actually outside the brickwork and all loads due to boiler arch thrusts, stack and superheater, are carried on the suspension. The design of the suspension frame readily accommodates itself to the support of additional loads such as coal bunkers, walkways, etc., while the stack, if desired, can be supported from the ground without flaring of the base or the use of



53

500 Horse Power Boiler, Stoker Fired, Coal Bins Attached to Boiler Suspension guy lines, by passing it through a horizontal girder at the rear top of the suspension frame (see illustration).

By means of an ingenious device employed in the lower drum, segregating several rows of the rear bank of tubes, the feed water is directed upward in these segregated tubes, thus providing a combined purifier and economizer effect, at the same time maintaining a positive circulation under all degrees of rating.

WRITE FOR CATALOG NO. 17

List of Prominent Users Furnished upon Application

MURRAY IRON WORKS CO.

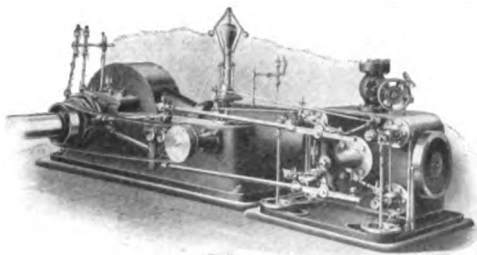
1870

BURLINGTON, IOWA

1918

Complete Power Plants—Corliss Engines—Boilers of All Types—Air Compressors, Pumping Engines, Feed Water Heaters, Rocking Grates

MURRAY CORLISS ENGINES are built either with girder frame, tangye frames or rolling mill frames of our patented design. *Ask for Catalogue No. 65.*



Murray Rolling Mill Type Corliss Engine

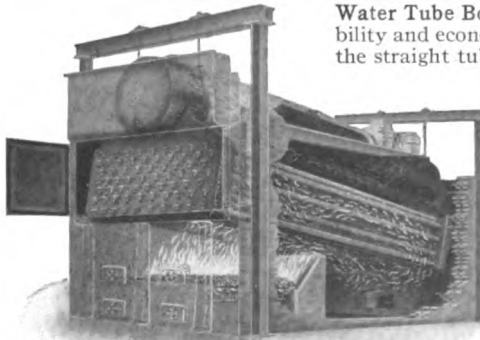
upwards. Capacities range from 100 to 1300 H. P. Tandem and Cross Compound Engines are built for any load required.

Murray Minor Corliss Engines, 20 to 70 H. P., are suitable for the smaller mills and factories.

Points of Superiority

- A. Excellence of materials.
- B. Best workmanship.
- C. Rigid inspection.
- D. Superiority of design in the following particulars of detail:
 1. The latest and most approved forms of frames, suitable for every purpose.
 2. High speed, ball-bearing governor with improved safety stops
 3. A form of cylinder whereby the exhaust passages are insulated from the cylinder by a dead air space.
 4. Improved valve motion.
 5. Improved dash pots, under the cylinder plate, or bolted to side of cylinder.
 6. Improved forms of steam and exhaust valves. (Double ported when specified.)
 7. An improved form of piston.
 8. Fly wheels made in halves, free from initial strains.
 9. Vertically adjustable outer pillow block with oil retaining rim.
 10. Broad pyramidal main bearing and cylinder feet or sole plates.
 11. New and improved style connecting rod.
 12. Improved cross head with adjustable shoes running in bored guides.
 13. Smallest possible clearance volume.

HIGH PRESSURE MURRAY BOILERS: The essential features of the **Murray Water Tube Boilers** are safety, simplicity, accessibility and economy of fuel and space. They are of the straight tube, all steel type, no cast iron being used in any part subject to tensile strain. They are made up of front and rear headers connected together with wrought circulating tubes and a top steam drum or drums, the whole set with an incline to the rear in an inexpensive bricksetting, those of 200 H. P. capacity and over being supported independently of the brick work by a cast iron column and steel girder gallows frame as shown.



Murray Water-Tube Boiler, with Suspension Rigging

We do not confine our customers to one type, but build the Tubular, the Water-Tube and the Internal Furnace. These different types of boilers are described in the following: Water-Tube—*Catalogue No. 60*; High Pressure Horizontal Tubular—Series "D," *No. 4 Pamphlet*; Standard Horizontal Tubular—Series "D," *No. 6 Pamphlet*; "Duplex"—*No. 75 Pamphlet*; Vertical and Portable—Series "D," *No. 10 Pamphlet*.

MURRAY IRON WORKS CO.

MURRAY DUPLEX INTERNALLY FIRED BOILERS

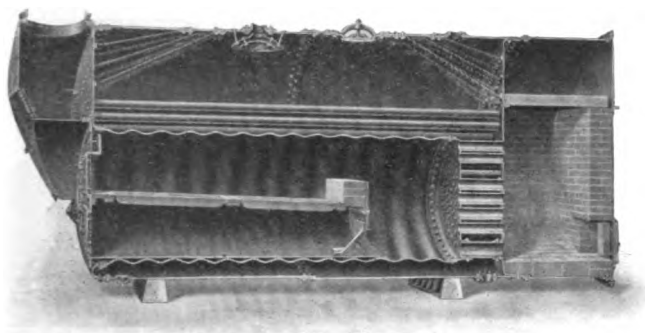


Fig. 1

A Different Principle of Circulation

The special feature of the Murray "DUPLEX" boiler is covered by letters patent No. 1,151,127 and this improved form of construction can only be used by the Murray Iron Works Company. The "Scotch" boiler as built heretofore, while nearly the ideal boiler for economy of fuel and space, had one decided weakness, namely, poor and unequal circulation. Owing to the location of the flues and the furnace the heat travels as shown in Fig. 2, and the lower part of the boiler is always cold, so cold, in fact, that in many cases you can safely put your bare hand on the bottom of the shell because all the heat of the fire is transmitted to the water in the upper half of the boiler.

55

This unequal heating has two serious drawbacks: first, the water in the lower part of the boiler being dead, only that above the furnace is in circulation, thus materially cutting down the capacity and efficiency of the boiler; second, the extreme difference in temperature between the top and the lower part of the boiler generally causes it to leak in the girth seam.

Fig. 2 correctly represents the fire travel and water circulation in the ordinary types of "Scotch" boilers.

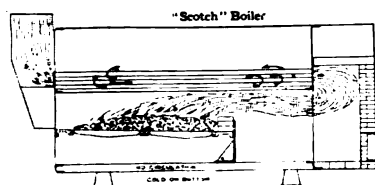


Fig. 2

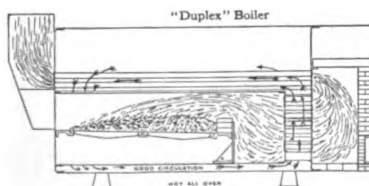


Fig. 3

In the Murray "DUPLEX" boiler the circulation is similar to that in an externally fired boiler. Our boiler becomes hot all over setting up a rapid circulation and overcoming all unequal expansion and contraction in the shell and furnace. You would need an asbestos mitten for safety if you placed your hand anywhere on the bottom of our boiler. Note the difference in circulation between a "Scotch" boiler and the Murray "DUPLEX" boiler as shown by Figs. 2 and 3.

"DUPLEX" Internally Fired Boilers are built in sizes of 50, 75, 100, 125, 150, 200 and 250 H. P.

These Boilers are Practically Smokeless

KROESCHELL BROS. CO.

Established 1879

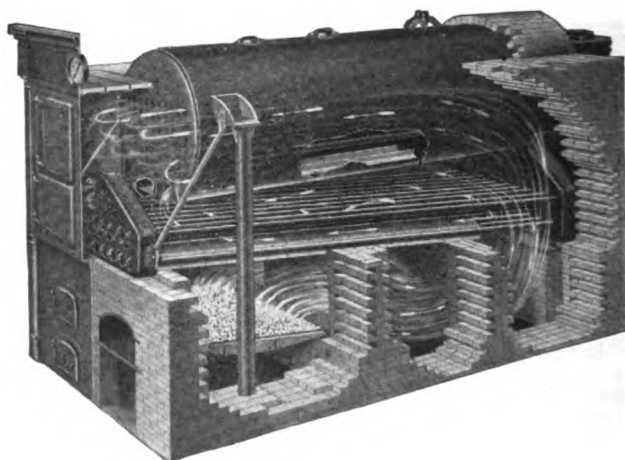
460 WEST ERIE ST., CHICAGO, ILL.

TELEPHONE: Superior 8680—Private Exchange All Departments

Boiler Manufacturers, Heating and Power Engineers, General Plate Work,
Steel Stacks, Breechings, Tanks, Feed Water Heaters, Crucible Furnaces
(Oil and Gas), Ideal Chain Wrenches

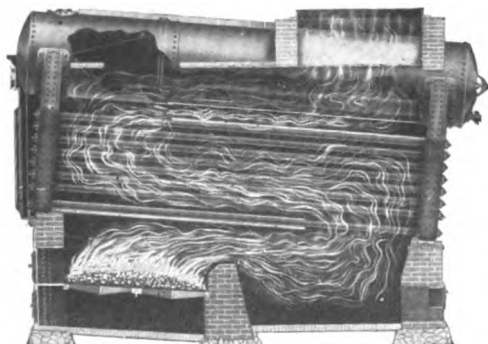
**THE
KROESCHELL
FIRE
&
WATER
TUBE
BOILER**

Patd. 1912



A highly efficient and convenient unit for medium capacities. Built in sizes from 100 to 300 Horse Power.

Especially designed for large energy storage and rapid steaming to meet requirements of fluctuating loads. Maximum capacity for minimum floor space.



**KROESCHELL
WATER TUBE BOILER**

Built for heavy duty service. The excellence of design and construction of this boiler has been demonstrated by nearly forty years of successful operation.

Sizes 100-700 H. P.

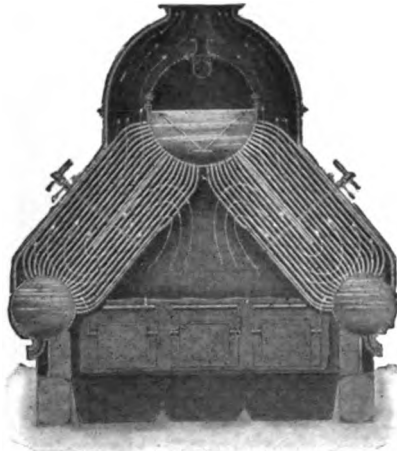
NEW YORK ENGINEERING CO.

2 RECTOR ST., NEW YORK CITY

THE COLVEN MARINE BOILER

The Colven Boiler is essentially a marine boiler, designed and built for this specific purpose. It embodies all of the special features demanded in this class of work, including the greatest reliability, economy and steaming capacity, within the smallest limited space and weight.

Simplicity: It will be seen at a glance that the Colven Boiler is simplicity itself—no screw joints; no headers with their numerous handholes and packed or ground joints together with their restricted passages—no straight tubes anchored into immovable ends or headers with no chance for expansion. The Colven Boiler contains no castings; every part is of wrought steel.



Style "A" Three-drum Type Colven Marine Boiler.

Expansion and contraction take place freely in the Colven Boiler without straining any one part.

Safety: The Colven Boiler is safest because every part is a true circle. There are no flat surfaces requiring numerous stay bolts and braces. There are no seams or riveted joints exposed to the fire, as they are all outside of the boiler casing, where they can always be observed.

Space Economy: The Colven Boiler occupies less space per square foot of heating surface than any other marine boiler.

Accessibility: It is a quick steamer, and steam can be raised in less than twenty minutes. The tubes can be cleaned on the inside, if necessary, by the usual methods. All parts of the boiler are accessible, and steam and water drum can be inspected simply by the removal of manhole covers.

Large Units for Rail Shipment: The Colven Boiler can be supplied in larger single units than any other type, thus decreasing the number of boilers required. Moreover, this boiler is usually assembled and completed in our shop, and large units, having from 3000 to 4000 square feet of heating surface, can be readily shipped by rail. The Colven Boiler, being shipped in its completely assembled condition, is ready for lowering into the hold of the vessel when it arrives at destination. It is due to this fact that a large amount of time and money is saved. With most other boilers it is necessary that they be shipped knocked down, thus leaving the most important and expensive part of the work to be done in the hold of the vessel. Facilities are provided for attaching the lifting gear to the Colven Boiler so that it may be readily lowered into the hold.

This boiler, owing to its large combustion chamber, is adapted to burning coal, oil or wood, equally as well.

This type of boiler has been used in the United States Navy, and has fully demonstrated all of our claims.

The Colven Boiler is built in two types, namely, the two-drum and the three-drum. It is readily adaptable to the limited conditions usually encountered in marine work, and it can be varied in detail to meet the most exacting requirements.

Bulletin on application.

OIL CITY BOILER WORKS

MAIN OFFICE AND WORKS: OIL CITY, PA.

EASTERN DISTRICT BRANCH: Astor Trust Bldg., Fifth Ave. & 42nd St., New York City

Manufacturers of Engines, Boilers, Tanks and Special Machinery

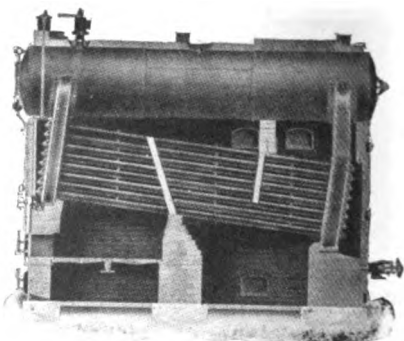
After many years' experience in the manufacture of boilers of various types, the Oil City Boiler Works in 1893, recognizing the increasing demand for economy, capacity and above all safety under high pressures, designed and placed upon the market the GEARY WATER TUBE BOILER, the original of the box header or water leg type, built with inclined tubes and horizontal drums.

The design of the Geary Boiler, after a record of twenty-five years for economy and durability, remains the same. Improvements in details, however, have been made from time to time to meet the advanced requirements in boiler construction.

THE GEARY WATER TUBE BOILER

consists of a bank of straight tubes, expanded at each end into wrought steel headers of box shape, strongly braced and stayed. The tubes are inclined, and the back header is made longer than the front, so that the drum or drums connecting the two headers lie level.

Circulation: The connection of the headers with the drum is made so as to provide large throat areas. There is no obstruction or contraction of area in the course of the circulation. The water flows quietly and steadily, carrying with it the bubbles of steam from the tubes into the front header, the inclination of the tubes aiding this and preventing the steam lodging in the tubes and forcing the water out with a geyser like action.



Longitudinal Section of Vertically Baffled Boiler

On top of the drum, centrally located, is placed a pressed steel flange for main steam outlet. Inside of this outlet is fitted a perforated Dry Pipe. This arrangement eliminates the use of any internal baffles or deflecting plates.

Numerous tests of Geary Water Tube Boiler installations—many under heavy overload conditions—show the entrained moisture in the steam to be less than 1 per cent.

Setting: When set the Geary Boiler is suspended at the front end from heavy overhead cross channels or beams by a heavy wrought iron loop bolt placed under the drum in front of the header and out of the path of the gases. The overhead channels or beams rest on top of steel upright columns which extend down to the foundations resting on heavy cast iron base plates. The uprights are placed at the extreme outside of the setting and removed from the heat of the furnace.

The rear header of the boiler rests on rollers, which in turn bear on heavy cast iron plates, firmly supported by the brick work of the substantial low rear wall of the setting or upon supporting stands. This method of supporting the boiler independent of the setting permits it to expand and contract without injury to the setting walls.

Sizes: The Geary Boiler is built in a range of sizes from 30 to 650 Horse Power, and many sizes about the same capacity, but of different dimensions, to meet the varied conditions of space, draft, fuel, furnaces and transportation, making it possible to select the proper size to meet the requirements and conditions governing any particular installation.

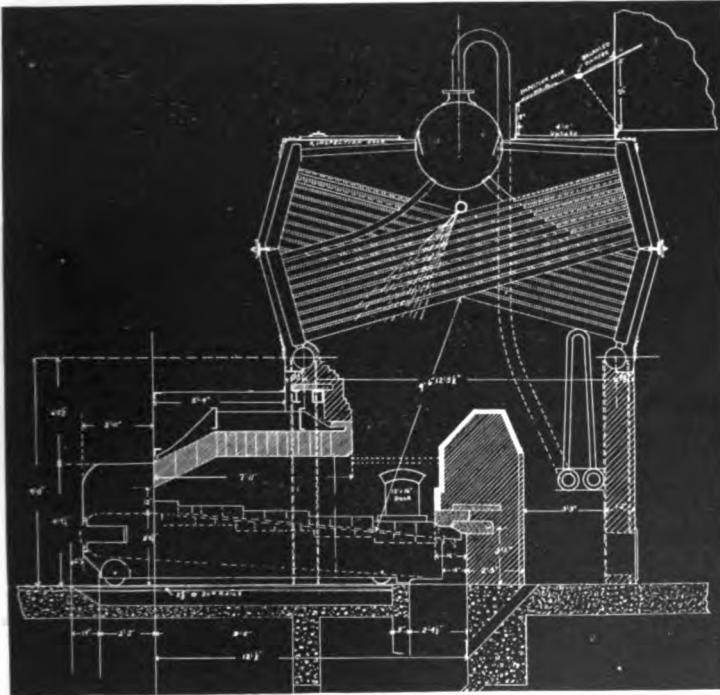
Units up to 420 H. P. are usually built up complete and thoroughly tested before shipment. Units of 500 H. P. and larger are shipped "knocked down."

PAGE BOILER COMPANY

GENERAL OFFICES:

815 TO 819 LARRABEE ST., CHICAGO, ILL., U. S. A.

Manufacturers of Water Tube Sectional Steam Boilers



59

PAGE-BURTON WATER TUBE SECTIONAL STEAM BOILERS SELF-CONTAINED

**Built for Any Space Conditions. Largest Power. Small Space.
Highest Efficiency. Absolutely Safe. Long Life.**

The Page-Burton Water Tube Boiler is self-contained. The steel enclosure is lined with air cell asbestos and fire brick. Air leaks are not known in this enclosure.

Boilers adapted to any type furnace—due to its sectional design, all material can be delivered into an opening 4 ft. by 4 ft. Largest power, smallest space. No trouble to keep boiler free from sediment inside and soot outside. The Page-Burton Boilers are equipped with our oscillating soot blowers. All sections blown in one minute, not a door to open.

The large mud drums are truly settling chambers and when properly handled the boilers may be washed out as quickly as a tubular type boiler.

Page-Burton Boiler, built for pressure of 140 to 275 lbs. Size units 75 to 1000 H. P.

Send for our new catalog. Patents pending.

Note large combustion area directly beneath the entire tube surface, every inch of water heating surface effective, gases are split up vertically and horizontally. Bafflings are at top which causes gases to expand as they pass through the entire tube sections and under the steam drum, the best possible efficiency is obtained.

SPRINGFIELD BOILER CO.

SPRINGFIELD, ILL.

Builders of "Springfield" Boilers

"SPRINGFIELD" WATER TUBE BOILERS

Sectional-Sinuuous Headers

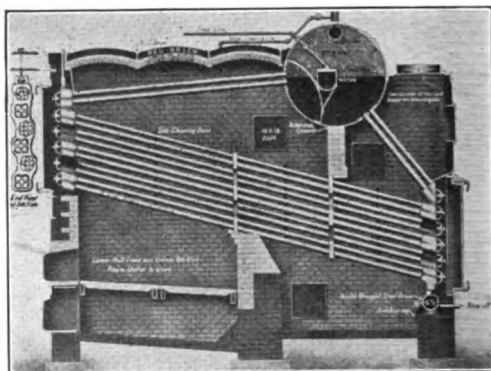
NO Staybolts

NO Braces

NO Bent Tubes

ALL STEEL Construction

FEW Handholes



Side Elevation

Illustration shows a complete section of the "Springfield" Water Tube Boiler in place, with the front header suspended and the rear resting on a ball bearing. This construction allows the header to come and go from any direction, relieves it from all strain, and does away with the wear and tear that is sure to follow in a boiler where the joints are rigid. The front headers hang from suspension rods. There are no riveted seams where the header is connected to the drum, as in water-leg boilers.

The 3-inch tubes are placed at an angle of 15 degrees. This gives rapid and perfect circulation. They are in groups of four, with one *hand-hole* to each group. Two-thirds less hand-holes than in other horizontal water tube boilers; this greatly facilitates and lessens cost of cleaning. Hand-holes have *inside steel plates*.

Each section is connected to the steam and water drum by four tubes; this gives very large liberating area, evenly distributed over the entire length of the drum. This insures perfect circulation. Drum of large diameter and special dry pipe insures dry steam.

Baffles are made of cast iron, with open face and cast iron sleeves, through which the tubes pass. They are filled with fire clay and cement, held in place by flame bars, and form a solid wall. They are indestructible. Permit removal of any tube without disturbing other tubes or baffles.

Tubes are staggered in such a way as to allow the gases to completely surround them. This allows a thorough mixture of the gases of combustion.

Boiler is very compact; occupies less space than any other horizontal boiler of like capacity and requires less brick for its setting; approximately 97 per cent of the total heating surface is *in the tubes*.

"SPRINGFIELD" INTERNALLY FIRED BOILERS

with Corrugated furnaces, have many valuable features to recommend them both to the Engineer and to the user. They are rapidly becoming adopted everywhere for both power and heating purposes. *Economical* in the use of fuel, floor space occupied, head-room, repairs, and because they are easy to clean.



Write for pamphlets and further data

TRADE MARK

UNION IRON WORKS

ERIE, PA.

Manufacturers of Steel Boilers

Branch Offices and Representatives in Boston, New York, Philadelphia, Syracuse, Buffalo, Cleveland, Pittsburgh, Toledo, Detroit, Chicago, St. Louis, Kansas City and San Francisco

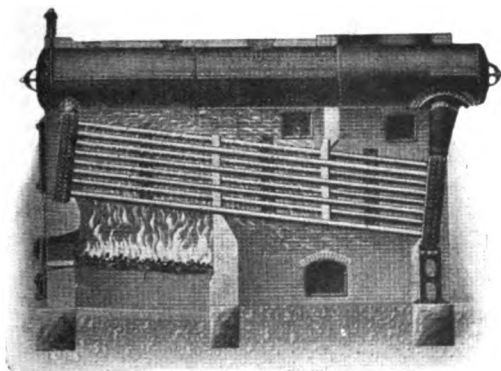
The Union Iron Works have been builders of steel high pressure steam boilers for nearly 30 years in Erie. From a modest start the development and growth has been rapid until today we cover about six acres with buildings consisting of main boiler shop, flange shop, blacksmith shop, machine and casting shop, stack and tank shop. All of these buildings are equipped with modern facilities and a highly trained organization for doing the very best work that can be done today. Our motto is Quality and this accounts for our growth and development.

An expert engineering staff is kept for development and other engineering work and no effort is spared to keep the product up to and ahead of the times if possible.

THE "UNION"

WATER TUBE BOILER

is the product of all these years of experience and is being built in its present form without any radical changes for about ten years. We have made some changes in the matter of equipment and minor details in keeping with progress of such equipment, but the distinctive features mentioned below have been in the boiler, thoroughly tested and tried for ten years:



61

1. Horizontal drums—liberating surface, dry steam, water storage capacity.
2. Purifier in drums, settling chamber out of fire and circulating element, oil trap, provided with blow-off connection. Additional blow-off bottom of headers.
3. Corrugated flange connection from drums to headers, no restricted area, good circulation, relieving boiler of internal strains.
4. Headers made in integral halves in one heat, of ample depth, no double plates or rivets exposed to fire, regular, not irregular pitch of staybolts.
5. Handhole plates of steel plate, each removable through hole it covers, no fishing, yoke of novel design, quickly removed. Special shape of handhole, easily kept tight.
6. Greater inclination of tubes promoting circulation, vertically staggered, horizontal spacing to permit proper cleaning on fire side. Ample gas passage areas.
7. The very best workmanship that can be done by a well-trained organization and modern facilities.
8. Continued operating efficiency and greater overload capacity than any other boiler, due to the combination of these features, resulting in less time required to clean boiler when necessary, longer period of continued efficient operation, minimum loss of time out of service.

We also build a complete line of Fire Tube Boilers and do steel plate work.

Condensed specifications and engineering data specially prepared for consulting and designing engineers. Free on request.

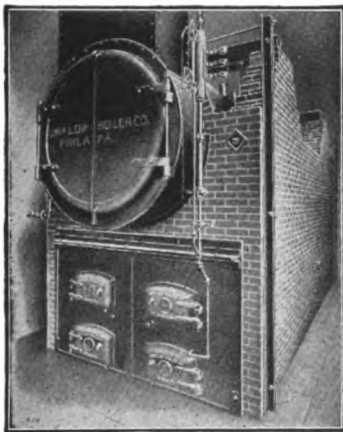
THE UNIFLOW BOILER CO.

GENERAL OFFICES: PHILADELPHIA, PA.

BOSTON PITTSBURGH MERIDEN, CONN. ROCHESTER CHICAGO SALT LAKE CITY SIOUX CITY

THE UNIFLOW BOILER

The Uniflow return tubular boiler has been designed and built to meet the present demands for the economical generation of steam. In addition to the advantages of durability, simplicity and low maintenance cost which many years of service of this type of boiler have proven beyond doubt, the Uniflow boiler is noted for



1. High operating efficiency.
2. Increased rate of heat transfer.
3. Positive rapid circulation.
4. Great steam disengaging area.
5. Delivery of dry steam.
6. Great overload capacity.
7. Compactness.
8. Cleanliness of heating surface.
9. Reduction of setting losses and upkeep cost.
10. Complete, efficient combustion.

Efficiency. The patented tube layout in the Uniflow boiler equalizes as much as possible the proportion of the gas area to the water content of the boiler. A most efficient and rapid transfer of heat, therefore, is obtained. The circulation paths in the Uniflow Boiler provide a positive unobstructed circulation of water in the boiler. The steam quickly

generated as the result of this efficient heat transfer and positive circulation rises rapidly to the steam space in the boiler. On entering into the steam space, the steam passes through the large disengaging area. By providing a large disengaging area for the steam, the dangers of priming at overload periods is entirely overcome. The regular guarantee specifies that the Uniflow will develop an efficiency of 74% and operate at 150% of rating without priming.

The ability of the Uniflow boiler to generate steam quickly, and pick up heavy overloads quickly has been demonstrated by installations in many plants. In every case the Uniflow Boiler has been able to meet the demand for steam quickly without loss in steam pressure. It has been said by many engineers that the quick steaming feature of the Uniflow excels even the water tube type of boiler.

Smokeless Combustion. The Uniflow Furnace constructed in every case under the Uniflow Boiler enables the Uniflow to consume bituminous coal as fuel with the smoke emission from the boiler at all times being within the limits of smoke formation as provided by the Local Smoke Bureau.

The compactness of the Uniflow Boiler compares very closely to the compactness of the water tube boiler. In some cases the floor space and head room required by the Uniflow Boiler is considerably less than that of the water tube. In comparison with the return tubular type, the Uniflow contains approximately 50% more heating surface in a given size shell. That is, the usual 72" x 18' return tubular boiler has a nominal rating of 150 horsepower and actually contains 1420 square feet of heating surface. The Uniflow Boiler of the same size contains 52% additional capacity, or 2160 square feet of heating surface, developing 216 horsepower as its nominal rating. A further advantage in the compactness is that the radiation losses from the boiler setting are very much less than the radiation losses in other types of boilers.

More efficient boilers represent the one logical solution of the high fuel cost and fuel shortage problems. The coal saving is actual and proved in practice, and not merely a theory in Uniflow Boilers.

Built in 33 standard sizes—prompt shipments.

HENRY VOGT MACHINE CO.

LOUISVILLE, KY., U. S. A.

Manufacturers of Ice and Refrigerating Machines, Water Tube and Horizontal Return Tubular Boilers, Sectional Steel Casings, Down Draft Furnaces, Shaking Grates, Oil Refinery Equipment, Paraffin Wax Presses, Drop Forged Valves and Fittings, and Other Drop Forgings

VOGT WATER TUBE BOILERS

The Vogt Water Tube Boiler is constructed to meet the demand for a strictly safe, durable and efficient steam generator, and is free from many objectionable features commonly found in other types of boilers.

Look at the cut for the obvious advantages of Vogt construction:

Wrought-steel throughout.

No flat stayed surfaces.

Accessibility for cleaning and inspection.

No multitude of hand-hole plates.

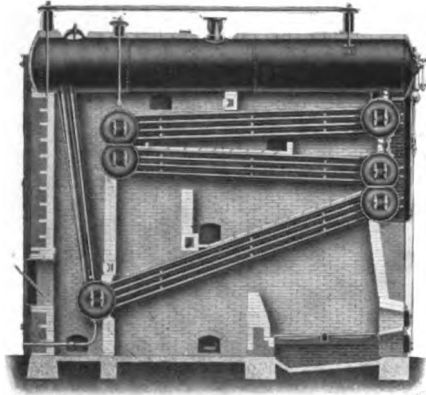
Rapid circulation.

Complete combustion.

Dry steam.

Steadiness of water level.

Flexibility of construction.



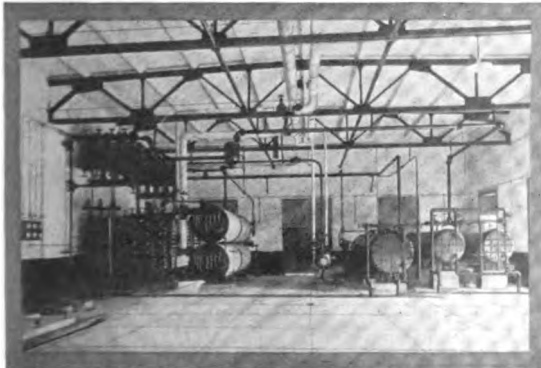
Sectional View Showing Advantages of Vogt Water Tube Boiler Construction

VOGT ICE AND REFRIGERATING MACHINES

Absorption System

The simple construction of the Vogt refrigerating machine is one of its many superior features.

They are built in sizes from 8 to 300 tons refrigerating capacity, and can be installed as an isolated unit or in connection with any type of power plant where steam is available.



125 Ton Vogt Exhaust Steam Refrigerating Machine

It consists of Generator, Aqua Ammonia Pump (either single, direct acting or fly-wheel type), Absorber, Exchanger, Rectifier, Condenser and Weak Liquor Cooler (either horizontal tubular, atmospheric or double-pipe type, depending upon water temperature and conditions).

Only one running part, the ammonia pump, makes the Vogt Absorption Machine the simplest, most economical and durable.

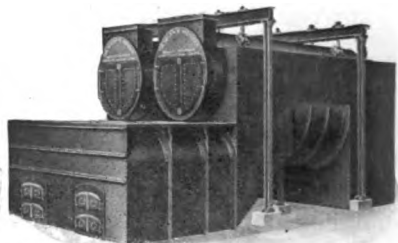
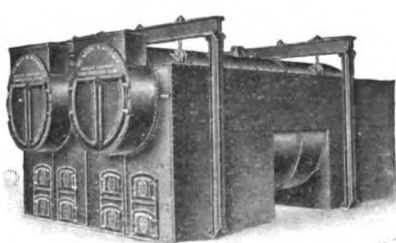
THE WALSH & WEIDNER BOILER CO.

FACTORY AND GENERAL OFFICES

CHATTANOOGA, TENN.

BRANCH SALES OFFICES:—NEW YORK—NEW ORLEANS—DALLAS—BIRMINGHAM—
HAVANA

**Manufacturers of Boilers, Tanks and Towers, Storage Tanks, Structural Steel
and Steel Plate Work of Any Description**



HORIZONTAL RETURN TUBULAR BOILERS

With or without steel casing setting. Special furnaces for all kinds of fuels
or refuse materials.

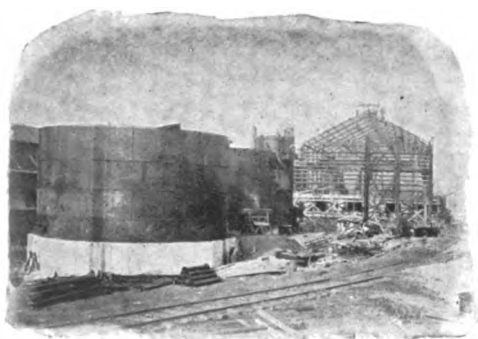


PLATE IRON WORK STRUCTURAL MATERIAL

All kinds of special plate iron and
structural work. Pressure and storage

tanks, steel riveted piping and other work for by-products plants, chemical
plants and all kinds of industrial work. Oil storage tanks, stills and agitators.
Sugar crystallizers and defecators.

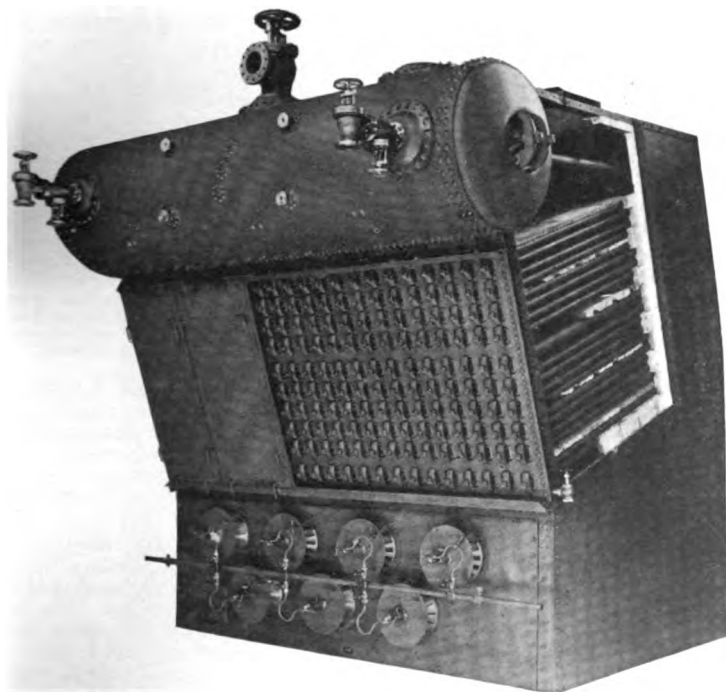


TOWERS AND TANKS

THE CHARLES WARD ENGINEERING WORKS

CHARLESTON, W. VA.

Manufacturers of Water Tube Boilers and Marine Engines



65

WARD'S WROUGHT STEEL MARINE BOILER

Improved and Most Rapid Circulation

Generating Tubes Expanded

No Other Joints

No Nipple Connections

No Staybolts

Illustration shows Ward Boiler of 4275 Square Feet Heating Surface

Contracts Awarded as Result of Evaporative Trials

16.73 Pounds Water per Pound of Oil

81.68 Per cent Efficiency

Built in 60 standard sizes, ranging from 1700 to 5000 S. F. H. S.

THE WICKES BOILER COMPANY

MAIN OFFICE AND WORKS, SAGINAW, MICH.

Sales Offices in Principal Cities

Manufacturers of Steam Boilers

WICKES VERTICAL WATER TUBE BOILERS AND STEEL CASED BOILER SETTINGS

Water Tube Boilers have proved their efficiency. The need is for very simple water tube boilers. The Wickes Vertical Water Tube Boiler has proved its superiority. **FIRST:** *It is constructed entirely of homogeneous material and uses straight tubes.* **SECOND:** *It operates with high commercial efficiency—the sum of all efficiencies.*

Two 12 x 16-inch manholes open in this boiler—one top—one bottom, inspection and cleaning is a simplified matter. Every tube can be looked through, washed or scraped.

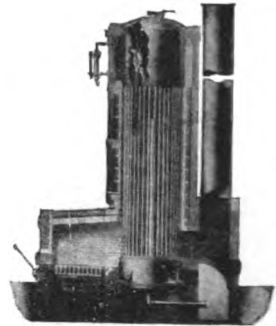
It is easy to clean. If you have ever cleaned a boiler and lamed your back, bruised your knees, and skinned your elbows, you will appreciate the accessible construction of this boiler. Two men can open, turbine and close the Wickes Vertical Water Tube Boiler in ten hours. You know how long it takes to clean some boilers. A clean boiler promotes efficiency. A boiler easy and quick to clean is likely to be cleaned often and well—that is human nature. When your boilers—any of them—stand idle there is a considerable investment upon which you must charge interest that is not earning money—that is not contributing its share to the profit of your Company. On the contrary it is a drag. The overhead and the unit cost of power is low when using this boiler, for it can always be in service.

High furnace temperature results from Dutch oven. Gases entirely surround and closely scrub heating surface from entrance to release. The gases cannot leave the heating surface. There is no possible chance for short-circuiting. The boiler heating surface absorbs the heat—empty pockets in setting lose heat. There are no empty pockets in this boiler. The steel cased settings are always tight, no cracked, warped, leaky, defective and unsightly settings exist with this type. A steel cased setting is a simple and sure cure for air infiltration losses. The largest preventable losses we have to contend with in boiler efficiency are excess air losses. A very long gas travel—hence long contact with heating surface is provided. Heat absorption is, therefore, assured.

Did you ever wreck an engine by pulling water over into it from the boiler? Study this boiler. The steam drum gives great height from water line to steam outlet nozzle. This height provides room for separation of the steam from the water which is entrained with it at a point close to the surface of liberation. Since the shell is subject to a mild degree of heat some superheat is effected on the steam leaving this boiler. You do not pull water over from this boiler.

The concentration of the greatest amount of power per square foot of floor space yet achieved can be attained using this boiler.

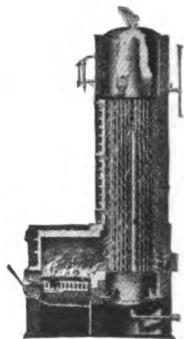
Are you interested in producing boiler horsepower hours per annum cheaply? If so, ask us for "Aids in the selection of boilers" or "How to reduce cost in the boiler room." Sent free.



Cut Shows Position of Man Cleaning. He Stands Erect. Is It Laborious Compared with Usual Forms?



Steel Cased Setting



Quick Steaming, Delivering Dry Steam

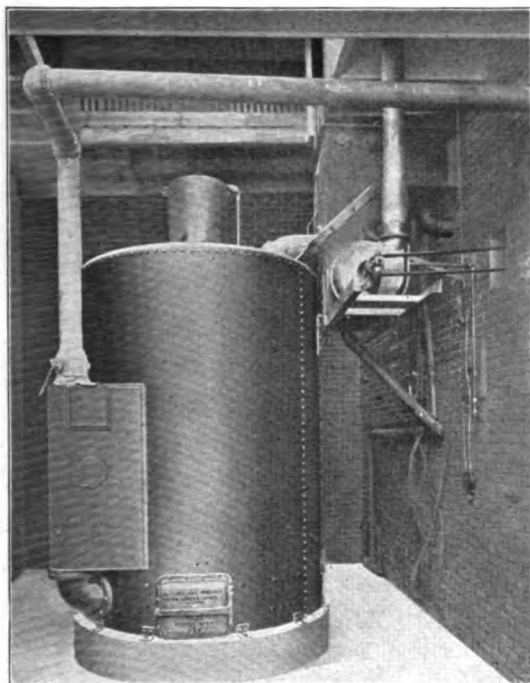


NELSON BLOWER & FURNACE CO.

11 ELKINS ST., BOSTON, MASS., U. S. A.

Manufacturers of Galusha Gas Producer; Positive Pressure Blowers and Furnaces; Stevens Under-Feed Stoker; Designers and Builders of Special Machinery and Fine Tools; Contract Grinding

ECONOMICAL POWER



67

GALUSHA GAS PRODUCERS

make gas out of coal, coke or charcoal for use in gas, gasoline, kerosene and natural gas engines instead of using more expensive fuel.

Fuel consumption is but ONE-QUARTER as much as for a steam plant of same horsepower.

Fuel costs ONE-TENTH as much as gasoline, ONE-FIFTH as much as kerosene, ONE-HALF as much as for Diesel engines and less than for natural gas.

Producer shown above is 150 H. P. size. It is supplying gas to a 150 H. P. engine generating electricity for power and lights. Engine formerly used from 10,000 to 15,000 cubic feet of natural gas per day. Fuel consumption now is one-half ton of coal per day.

TWELVE YEARS IN USE WITH MANY DIFFERENT MAKES OF ENGINES IN NORTH, CENTRAL AND SOUTH AMERICA, EUROPE, CHINA, AUSTRALIA AND ISLANDS OF THE SEAS.

Write at once for full information about the most ECONOMICAL and RELIABLE land and marine power plants that can be procured today.

GLASGOW IRON COMPANY

POTTSTOWN, PENNA.

PHILADELPHIA
603 Harrison Bldg.
15th & Market Sts.

NEW YORK
D. F. COONEY & Co.
88 Washington St.

BOSTON
HARRINGTON, ROBINSON & Co.
Sargent Bldg.

Manufacturers of All Grades of Iron and Steel Plates

FLANGED and DISHED BOILER HEADS.

Flanged Manholes—Handholes and Flueholes.

ROE STAMPED STEEL MANHEAD and YOKE.

Standard and Heavy Threaded Pipe Flanges.

Companion Flanges—Off Center Pipe Flanges.

MANHOLE SADDLES.

BUCKLED PLATES.

ROE BOILER LUGS.

Rectangular Flanged Heads.

**WELDING AND CUTTING with the OXY-ACETYLENE
TORCH.**

Many shapes formerly made in expensive Bronze Castings can now be made from Steel Plate by Press Work in combination with AUTOGENOUS WELDING.

Pressed Steel HOT BLAST VALVES and VALVE SEATS, Patented.

BOSH COOLING PLATES—TUYERE COOLERS.

FORMING, CUTTING OUT, PUNCHING and BENDING Plate to order.

Bending and Forming ANGLES and SHAPES.

The GLASGOW FLAT FLANGES for Riveted Pipe.

Pressed from Steel Plate—For Any Service.



Made PLAIN or
BORED, FACED,
HUB BEVELLED,
DRILLED, to order.
Any thickness of plate.
6 ins. to 72 ins. INSIDE
DIAMETER.

These FLANGES, made with wide flanges, make Excellent Expansion Joints for Pipe Lines.

Correspondence Solicited.

LUKENS STEEL COMPANY

COATESVILLE, PA.

PHILADELPHIA
Commercial Trust Bldg.

NEW YORK
Whitehall Bldg.

BOSTON
Board of Trade Bldg.

BALTIMORE
Continental Trust Bldg.

NEW ORLEANS
634 South Peters St.

CLEVELAND
Rockefeller Bldg.

CHICAGO
1300 N. Branch St.

LOS ANGELES
Citizens Nat. Bank Bldg.

SAN FRANCISCO
Monadnock Bldg.

Cable Address: Lukens, Coatesville, Pa.

Codes—A B C—5th Edition, Western Union

LUKENS

FIRST TO MAKE BOILER PLATES IN AMERICA

One Hundred Years' Experience

The Leader for Boilers and Fireboxes of All Types.

All our plates leveled by special straightening rolls.

STEEL PLATES

THE LARGEST MILL IN THE WORLD

A New 204" Plate Mill.

We will be able to furnish plates 190" wide.

69

Siemens-Martin O. H., Basic or Acid Steel.

Tank, Boiler, Ordinary Firebox, Locomotive Firebox and Special Specification Steel.

UNIVERSAL PLATES

8" wide up to 48" wide, inclusive, $\frac{1}{4}$ " thick and heavier.

FLANGING

Machine-Flanged Boiler Heads, Flanged and Dished Boiler Heads, Flue Holes of any diameter.

We can furnish irregular flanged heads or would be glad to quote on any special flanging as we are especially equipped to take care of same.

"BEST YET" MANHOLE FITTINGS

Our New Patented Manhole Cover Plate has no through riveted bolts. Meets all requirements of Steamboat Inspection Rules.

HUSTON PATENT BOILER BRACE

Superior in quality, strength, lightness in weight, workmanship, general appearance and finish.

Send us your inquiries, stating just what you want, and get immediate replies.

MONONGAHELA TUBE CO.

PITTSBURGH, PA.

**Manufacturers of Iron and Steel Boiler Tubes, Oil Well Tubing and Casing,
Line Pipe, Etc.**

KNOBBLED CHARCOAL IRON BOILER TUBES SOFT STEEL BOILER TUBES

Made to American Society of Mechanical Engineers Specifications

All sizes from 1½" to 6" diameter both inclusive.

Particular attention is called to a very important change in the meaning of the thickness of gauge as called for in the boiler tube specifications of The American Society of Mechanical Engineers. The trade custom heretofore in vogue has been that the gauge of the tube meant its average thickness, with an allowance of a variation of one gauge above or one gauge below the one specified. The A. S. M. E. specification, however, states that hereafter all tubes intended for boilers that are to be built according to the A. S. M. E. Boiler Code *must not be less in their thinnest portion than the gauge specified.*

For tubes for locomotives, the old specifications of the Master Mechanics and the American Society for Testing Materials are still in force. It is therefore necessary, when ordering boiler tubes, that the customer state whether they are intended for stationary boilers according to the A. S. M. E. specifications, or whether they are intended for locomotive boilers and their respective specifications.

Tube List No. 6, dated February, 1916, sent on request.

GENUINE WROUGHT IRON LINE PIPE OIL WELL TUBING AND CASING

All Monongahela Pipe and Tubes are manufactured from highest quality material and by the Lap Weld process only under most improved methods.

We carry large stocks for quick shipments.

We make all sizes of Line Pipe 1½" to 6" both inclusive, Oil Well Tubing 1½" to 4" both inclusive and casing 3¼" to 8¼" both inclusive.

Price on Wrought Iron Line Iron Pipe, Oil Well Tubing and Casing sent on request.

**Also Sole Manufacturers of
"ARMCO" (AMERICAN INGOT) IRON
BOILER TUBES, LAP WELD PIPE AND MERCHANT CASING**

In "Armco" goods we make all sizes of Boiler Tubes and Pipe 1½" to 6" both inclusive, and Merchant Casing all sizes 2¾" to 8¼" both inclusive.

List of "Armco" American Ingot Iron Boiler Tubes, Pipe and Casing, can be had on request.

"Armco" Iron Resists Rust.

THE ROTO COMPANY

HARTFORD, CONN.

Manufacturers of Tube Cleaners

ROTO BOILER TUBE CLEANERS

Type A. D.—Driven by Air or Steam

Type W. D.—Driven by Water

FOR CLEANING

Steam Boilers of All Types

Fuel Economizers

Locomotive Arch Tubes

Condensers

Heaters, Evaporators, Etc.

THE USE OF ROTO
CLEANERS IS ESSENTIAL
TO THE MOST EFFICIENT
OPERATION OF STEAM
POWER PLANTS BE-
CAUSE THEY ARE—

THE SAFEST—Note the
long, straight, double supported
cutting surface, held firmly
parallel to the tube surface.
The Crowned Cone Cutters
cannot scratch the tube.

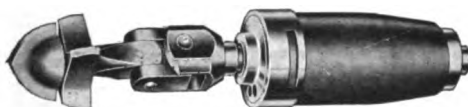
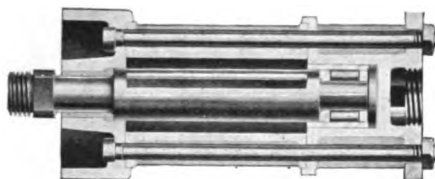
THE MOST THOROUGH
—The Motor cannot be ad-
vanced in the tube until all
of the scale is removed.

THE MOST RAPID—The
savings in labor, power to
drive the cleaner and time
of the boiler will pay for the
cleaner in a short time and
continue to save thereafter.

SEND FOR OUR
CATALOGUE



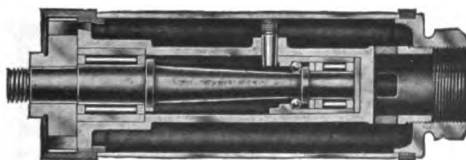
Type A. D. for Straight Tubes



Type A. D. for Curved Tubes



Type W. D. for Straight Tubes



Type P. M. Geared Tube Motor

THE "S-C" REGULATOR MFG. CO.

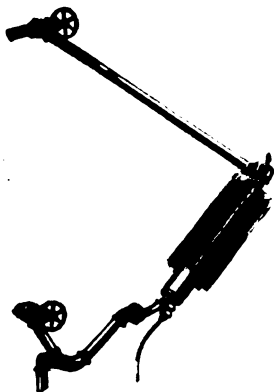
FOSTORIA, OHIO, U. S. A.

Feed Water Regulation Engineers

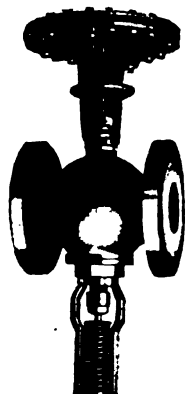
MECHANICAL FEED WATER REGULATION

Graduation in proportion to load and fire conditions—continuous feed at all times.

For power boilers from 10 H. P. to 3500 H. P. and steam pressures from 50 lb. to 1000 lb.



Generator or Actuating Element
of Feed Water Regulator



Regulating Valve

Specifications

1. All piping necessary (with exception of $\frac{3}{4}$ -inch blow-down pipe) to be included and cut to the proper length.
2. All piping furnished to be of seamless brass tubing.
3. Regulating valve to be made of best quality (88-10-2 mixture) steam metal bronze.
4. Valve seats to be inserted and renewable and of monel metal.
5. Valve disc to be of steam metal bronze with monel seats.
6. Regulating valve to be tight at seats on 350 lb. pressure when shipped.
7. Regulator to operate without any heat and water wastes from exhausts.
8. Regulator to be installed without use of iron frames, braces, hanger or platforms.
9. Regulating valve to be installed at any convenient point in feed line and under no circumstances require any change in feed line.
10. The complete regulator to operate and give continuous feed in proportion to evaporation and furnace conditions.
11. Regulator to operate without any lost motion and without the use of floats, weights, levers, chains, pilot valves, expansion tubes or other unreliable mechanisms.
12. Each Regulator to have a self-contained bypass.

Write for Bulletin 24

THE GREEN FUEL ECONOMIZER CO.

BEACON, N. Y.

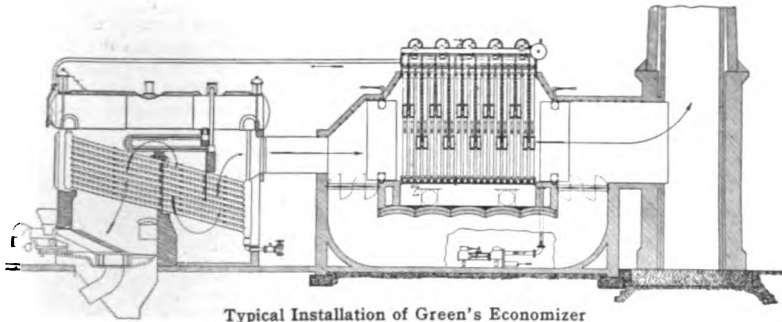
GENERAL SALES OFFICE: 90 WEST ST., NEW YORK, N. Y.

CHICAGO BOSTON PHILADELPHIA PITTSBURGH CLEVELAND ATLANTA ST. LOUIS
SAN FRANCISCO LOS ANGELES SEATTLE SALT LAKE CITY TUCSON HONOLULU

Associated with GREEN'S ECONOMISER, LTD.: TORONTO, MONTREAL, WINNIPEG
E. GREEN & SON, LTD.: WAKEFIELD, ENGLAND

Builders of Green's Economizers; Green's Steel Plate Fans; Green's High-efficiency High-speed Radial Flow Fans; Mechanical Draft Installations

GREEN'S ECONOMIZER



Typical Installation of Green's Economizer

Green's Fuel Economizer is the counter-current or multi-stage principle applied to steam generation. The boiler is required for absorbing from the gases of combustion the heat required for vaporization and to provide for the separation of the steam from the water, but the boiler surface should not extend beyond the point where the heat absorbed per square foot is worth less than the annual charges and upkeep upon that square foot. To extend the boiler surface beyond this point is wasteful, since it will not repay fixed charges, and if an economizer is used the boiler can to advantage be terminated before this point.

The Economizer, however, absorbs heat economically from flue gases at temperatures down to 300° F., primarily because it contains water at a temperature lower than that of the boiler contents, giving a greater "temperature head" than in the case of the boiler surface, also because it costs less, square foot for square foot, and is subject to a lower annual percentage for upkeep and depreciation than is the boiler surface.

As ordinarily installed, the Economizer reduces the flue gas temperatures from 600° F. to 300° F., saving 1% of fuel for each 20° reduction in the flue gas temperature. The Economizer pays from 40% to 100% interest upon the investment annually, depending upon operating conditions.

The following is a rough rule for determining the size: Allow about 5 sq. ft. of economizer heating surface per rated boiler H. P.

- 9' Tube has 12.75 sq. ft. Heating Surface.
- 10' Tube has 13.96 sq. ft. Heating Surface.
- 11' Tube has 15.17 sq. ft. Heating Surface.
- 12' Tube has 16.38 sq. ft. Heating Surface.

For further details and information consult nearest office.

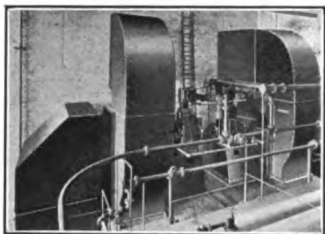


B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS.

Offices in all Principal Cities

Mechanical Draft, Fuel Economizers, Steam Turbines, Steam Engines, Gasolene Engines, Gasolene Engine Generating Sets, Motors, Generators, Steam Traps, Heating and Ventilating Systems, Fans, Blowers, Exhausters, Etc.



MECHANICAL DRAFT

Draft produced by a fan is called mechanical draft, and may be forced or induced as conditions demand. Its cost is from 20 to 40 per cent of that of a chimney. Its intensity permits of the burning of finely divided or low grade fuel. It makes possible the utilization of the flue gases which a chimney wastes in producing draft, it is independent of the weather, decreases smoke, increases the capacity of an existing plant, and serves as an auxiliary to a chimney already overburdened. It saves space and is portable.

FUEL ECONOMIZERS

The Sturtevant Economizer effects:

- A saving of 5 to 15 per cent in fuel,
- An increase of 10 to 25 per cent in boiler capacity,
- An appreciable extension of the life of a boiler,
- A purification of the feed water,
- A reduction in expense of repairs,
- The deposit of large amounts of soot,

In the Sturtevant Economizer the pipes are arranged "staggered" instead of in straight rows, thereby giving the pipes a better opportunity to absorb heat from the gases. These economizers are made with taper metal-to-metal joints that require no packing, cement or rusting. The placing of the pipes of one row opposite the spaces of the adjacent sections increases the effective area of the transmitting surfaces and thoroughly breaks up the currents of hot gases by directing them between the pipes and against those standing in their paths.

STEAM TURBINES

The Sturtevant Steam Turbine is of the multi-velocity type, and its operation is such as to give high efficiency, and permit of moderate rotative speeds without gears. Hand valves are used for shutting off the nozzles, and the speed is regulated by a centrifugal throttling governor placed on the end of the shaft.

Internal lubrication is unnecessary, therefore the exhaust steam is free from oil.

5 regular sizes from 5 to 250 H. P.

Approximate speed from 4000 to 1000 R. P. M.

STEAM ENGINES

(Automatic High Speed)

Vertical Single Cylinder from 1 to 150 H. P.

Horizontal Center Crank Engine from 25 to 225 H. P.

Sturtevant Engines are adapted to continuous operation for long periods without attention. Gravity lubrication and complete enclosure of moving parts insure cleanliness and high mechanical efficiency. Rites Governor gives $1\frac{1}{2}$ per cent speed regulation on automatic engines.

MOTORS, GENERATORS AND GENERATOR SETS

Direct Current Apparatus for any Standard Voltage

Bi-Pole Motors (enclosed and semi-enclosed type).....	$\frac{1}{4}$ to	3 H. P.
Four-Pole Motors.....	2 to	30 H. P.
Eight-Pole Motors.....	1 to	225 H. P.
Six-Pole Generators.....	5 to	$17\frac{1}{2}$ K. W.
Eight-Pole Generators.....	20 to	150 K. W.
Turbine Generating Sets.....	3 to	50 K. W.
Steam-Engine Generating Sets.....	5 to	150 K. W.

B. F. STURTEVANT COMPANY

STEAM TRAPS

Sturtevant steam traps made for different pressure, are designed for steam heaters or radiators of any construction. Both extension and cone are of brass ground to a fit. The pot is readily removed for cleaning by loosening the bolts.

PROPELLER FANS

Propeller fans are designed for use against low pressures, and are applicable for ventilation and exhauster work in boiler and engine rooms, kitchens, clubrooms, smoking rooms, offices, stores and similar places. They are constructed with a frame of cast iron that is fastened into the wall of the building and are driven by either belt or direct-connected electric motors. The construction of these propeller fans is exceptionally strong and durable. Propeller fans are made in sizes of from 18 to 120 inches in diameter.



MULTIVANE FANS

Multivane blowers and exhausters driven by direct-connected Sturtevant motors, turbines, and engines form the most satisfactory and efficient fan sets on the market. The blast wheel or runner for this fan is composed of shallow floats, which permit the use of very large inlets while maintaining the necessary blade area. The large inlet allows the air to enter with the least loss in friction.



Each blade or float is spooned to distribute equally the pressure within the casing and to add rigidity and strength to the wheel.

STEEL PLATE FANS

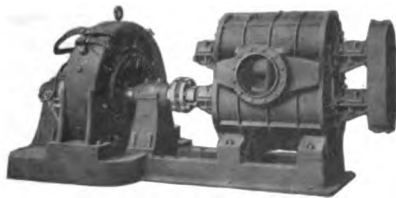
Sturtevant steel plate fans are designed for all classes of blower and exhauster work. They are the result of fifty years' experience in blower design, are especially strong and durable and are suitable for direct-connected steam engine and electric motor drive and for belt drive. Steel plate fans are built for ventilation and mechanical draft installations, and for planing mill and other exhauster work.

BLOWERS AND EXHAUSTERS

Positive Pressure Blowers are designed to deliver air at pressures up to five pounds. They are especially adapted to furnishing blast for cupolas, gas and oil burners, annealing and smelting furnaces, cement kilns, and for all sorts of blower or exhauster work demanding high pressures. Special stuffing-boxes to prevent leakage are furnished when these blowers are used to handle gases.

The Sturtevant Positive Pressure Blower is made in two types; in the smaller sizes the idler is directly above the impeller, and the shafts lie in a vertical plane. In the larger sizes, the shafts are in a horizontal plane, the intake and discharge being at the bottom and top.

The B. F. Sturtevant Company makes complete installations, including direct-connected, belted, or geared engine or motor, exhauster, automatic regulator, blast gates, by-pass connections, and valves.



STURTEVANT HEATERS

The Sturtevant fan system of heating and ventilating is economical and positive, heated air providing ventilation as well as heat. Indirect hot blast coils are built of one inch extra heavy steel pipe screwed into cast iron sectional heater bases. Entire heater is enclosed in steel plate casing. Heater is applicable to use of either live or exhaust steam or hot water. System can be used for heating and ventilating any kind of building. The operation is independent of the weather or of atmospheric conditions. By the use of the Sturtevant air washer, the air may be washed at all times, and cooled in summer. Hot air from the heater is forced by a fan through ducts into the building to be heated, and is allowed to escape through vent flues. Fans are driven by steam engine, motor or belt. The steam engine exhaust is used in the heater, thus obtaining heat at practically no expense. Temperature of air entering each room may be closely regulated by thermostatic control.



COPPUS ENGINEERING AND EQUIPMENT COMPANY

MAIN OFFICE AND WORKS
WORCESTER, MASS.

BRANCH OFFICES: NEW YORK, PHILADELPHIA, PITTSBURGH, HAZLETON, PA., BIRMINGHAM, ALA., CLEVELAND, CHICAGO, NEW ORLEANS, ST. PAUL, MONTREAL, TORONTO, WINNIPEG

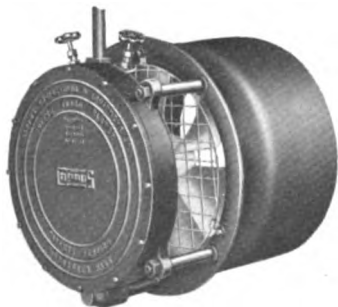
Engineers and Manufacturers of Turbo Blowers, Steam Turbines and Turbo Pumps

COPPUS TURBO BLOWERS

are made in two styles, Propeller and Centrifugal. The Propeller type blowers are adapted for delivering large volumes of air at low pressures and are largely used for forced draft for boilers. The Centrifugal

type is fitted for smaller volumes at higher pressure and are used extensively in connection with Gas Producers and for industrial purposes.

Construction: Coppus Turbo Blowers consist of a single or double stage Impulse Turbine entirely enclosed on the same shaft with the Propeller Fan. The particular use for which they are intended requires the utmost simplicity of apparatus and absolute fool-proof provision, as the blower is generally located and operated where ash and dirt are plentiful.



Coppus Turbo Blower

The Coppus will stand a great deal of abuse without any harm being done to the machine. Even if it was covered with soot and ashes no dirt or dust would enter the bearings and we recommend to apply the water or steam hose for cleaning fan and casing occasionally. The blower needs no attention on account of an oiling system which maintains a constant oil level for the ball bearings even if the oil supply diminishes. The blower has no packing boxes or any other features that call for adjustment.

Special attention has been given to the design of the fan casing in order to insure the highest efficiency. The casing closely hugs the fan and is expanded immediately beyond. This relieves the choking effect on the air by the casing, greatly eliminates friction, and prevents the formation of eddy currents.

Advantages: Coppus Turbo Blowers automatically operated by means of damper regulator and balanced valve give a perfect draft control. They give draft adjusted to the coal—handling any and every grade with utmost economy.

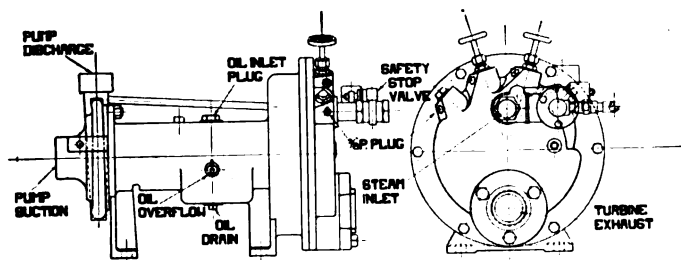
They give flexibility of draft immediately variable to sudden changes in steam demand. They give absolute emancipation from weather conditions—draft that is better than the most favorable natural draft.

Thus constant steam pressure is always assured regardless of load, fuel, or weather conditions if the boilers are equipped with Coppus Turbo Blowers. We are equipping from one hundred thousand to two hundred thousand boiler H. P. per month.

COPPUS ENGINEERING AND EQUIPMENT COMPANY



CENTRIFUGAL
TURBO BOILER FEED PUMPS



Type CCC

Size	Capacity	Steam Consumption
1 1/4" CCC	100 to 500 Boiler H. P.	70 to 75 lbs. per H. P./hour
1 1/2" CCC	500 to 1000 Boiler H. P.	65 to 70 lbs. per H. P./hour

Type TB: Capacities up to 4000 boiler H. P. and any pressure.

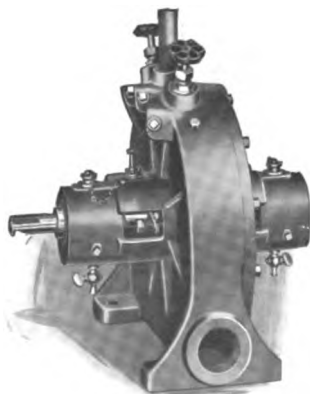
Construction: In our Type CCC both Turbine and Pump overhang the bearings which makes for simplicity in construction. The pump is of necessity single stage. One oil reservoir serves both bearings and on account of a very ingenious oiling system the oil level for the ball bearings is maintained regardless of the oil in the oil chamber. This pump contains no stuffing boxes. It is a compact, complete unit eliminating the possibility of disalignment.

In our Type TB the Pump and the Turbine have out-bored bearings. Where the boiler pressure makes it necessary the Pump is built multi-stage and is split vertically. Like the Type CCC it is a self-contained unit, one single shaft carries the propellers and steam turbine.

These pumps give a continuous flow of water to the boiler without pulsation with a high steam economy over reciprocating pumps.

STEAM TURBINES

We build small steam turbines up to twenty-five H. P. for either belt or direct connection to propellers, dynamos, blowers and pumps.



Coppus Steam Turbine

THE AUTOMATIC FURNACE CO.

MAIN OFFICE AND WORKS: DAYTON, OHIO

Manufacturers of the Model Automatic Smokeless Furnace, the Model-Chicago Chain Grate, the Model-Acme Engine

THE MODEL AUTOMATIC SMOKELESS FURNACE

Built in all Sizes for all Types of Boilers

The Model Automatic Smokeless Furnace is an improved form of the side-feed type and embodies greater utility than any other make or type. It is the latest designed and the result of more than a quarter of a century of experience with a knowledge of all forms of mechanical stoker furnaces in use.

Special Features: The Model Automatic is operated on natural draft and is not only superior in constant, efficient self-cleaning and smoke prevention, but is also designed to and does give effective protection and great durability, and, when repairs are necessary, renewal of any part can be made readily without disturbing other parts. The principal parts of the Model Automatic are not exposed to damage and will last a lifetime.

Operation: A small steam engine or electric motor is furnished with each furnace, battery, or row of furnaces and fitted to a set of double worm gears. The exhaust steam is utilized in connection with our steam shower beneath the clinker bar and grates.

Draft and Automatic Regulation: The Model Automatic operates with either natural or "induced" draft. Gives good results both in smoke prevention and fuel economy under stacks where the draft is less than .2 in. over the fire, but a strong available draft is desirable where strong or sudden crowding of boilers is necessary. A combined automatic damper and engine regulator can be applied so that the steam pressure will control the rate of combustion and the rate of feed of fuel to correspond. This combination regulator is most decidedly useful in large or small plants having variable load.

Adaptability: The Model Automatic can successfully handle and burn with superior economy any known bituminous coal mined between the Atlantic and Pacific oceans, and it can be adapted to any make or form of boiler and to almost any conditions of boiler room, fuel or duty requirements.

We also manufacture the Model-Chicago Chain Grate for situations to which this type of stoker is adapted.

THE MODEL ACME STEAM ENGINE

For many years we have been successful manufacturers of small steam engines and there are now several thousand ACME engines in operation driving mechanical stokers, generators, core drills, air compressors and similar units. These engines are designed to operate under a steam pressure from eighty to two hundred pounds and at a speed of one hundred and fifty to six hundred R. P. M. Built in units from 1 H. P. to 50 H. P.



Cross Section View



Installation of 650 H. P. Furnaces

DETROIT STOKER COMPANY

DETROIT, MICH.

THE DETROIT "V" TYPE STOKER

Coal is continuously fed from the Coal Magazines to the upper end of the Grates. Each alternate Grate has a slicing motion which prevents clinker from forming on the Grates and keeps the entire fuel bed moving towards the Clinker Crusher at the bottom.

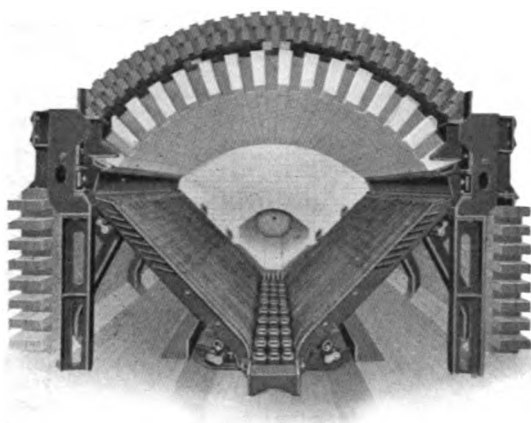
The Clinker Crushers have a continuous motion, grinding the clinkers and depositing the refuse in the Ashpit below.

The Detroit Stoker can be equipped with either the Radial Sprung Arch or the Detrick Flat Suspended Arch. Each tile of the Flat Arch is independently suspended from the center, allowing free expansion and contraction, and can be easily replaced without disturbing the Arch or brickwork.

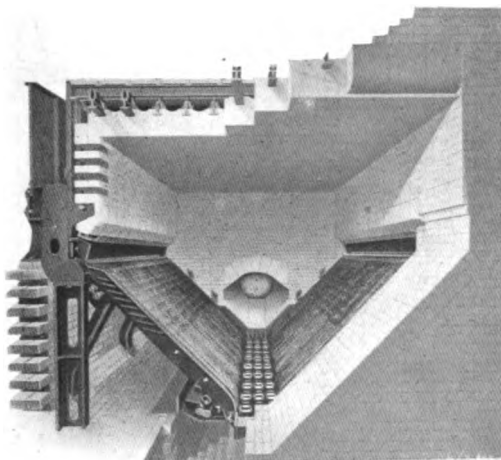
This Arch insures high furnace and boiler efficiency and capacity as the gases of combustion are distributed evenly across the entire width of the Boiler.

The Arches are cooled by air admitted through openings in the front of the Stoker and being preheated passes into the furnace under control, through the tuyeres over the coking coal supplying the oxygen for combustion.

Adjustments of the Stoker are easily and quickly made to meet any conditions of load or any grades of fuel.



Rear View—Detroit "V" Type Stoker with Radial Sprung Arch



Rear View—Detroit "V" Type Stoker with Detrick Flat Suspended Arch

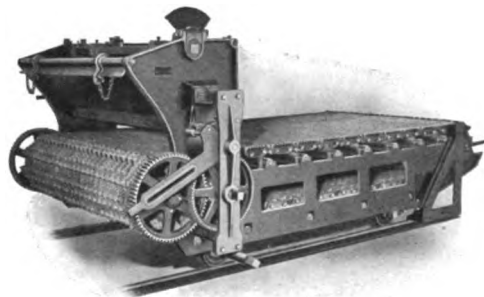
Send for Catalogue D. Address Detroit Stoker Company, Detroit, Mich.

GREEN ENGINEERING COMPANY

SHOPS AND MAIN OFFICE

13 KENNEDY AVE., EAST CHICAGO, IND.

Manufacturers of Green Chain Grates; Green Sealflex (Flat Ventilated) Arches; Green Pressure Waterbacks; Green Ratchet Ash Drags; Green Steam Jet Ash Handling Systems



"K" Type for Free-burning Coals

GREEN CHAIN GRATES

Green Chain Grates and their Settings are designed to insure best results under the conditions peculiar to each installation.

Green Chain Grates are built with frame and all supporting parts away from deteriorating effects of heavy firing. This means added years of service life. They can always be brought back to their original high efficiency and capacity at a slight cost for replacements.

Green Chain Skids instead of roll type chain supports practically eliminate "droppage" through the chain.

Green Chain Grates are built in any width from 3 to 14 ft. and length from 9 to 13 ft. Driving mechanism of cast steel ratchets and cast steel spur gear train, babbitted in a self-contained independent frame. This frame is bolted to the side frame of the stoker.

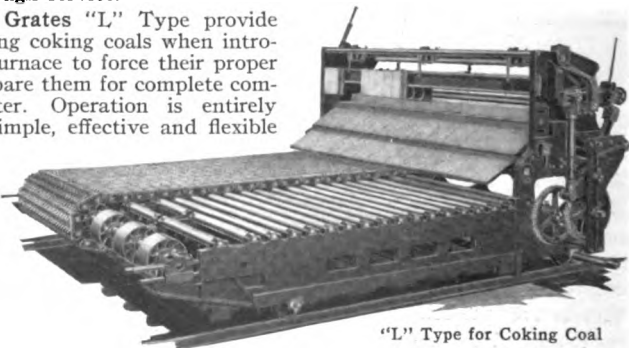
Green Chain Grates have a feed gate and driving mechanism which permits quick and positive adjustment to meet varying load conditions. They are built rugged and heavy, and protected where necessary to withstand the high temperatures and rough service.

Green Chain Grates "L" Type provide means for treating coking coals when introduced into the furnace to force their proper ignition and prepare them for complete combustion thereafter. Operation is entirely automatic but simple, effective and flexible through a wide range of capacity.

Green Chain Grates "L" Type provide the advantage of entirely automatic operation for economical

combustion of coking coals with uniform and continuous high economy and high capacity found in no other mechanical stoker.

Green Sealflex (Flat Ventilated) Arches mark a distinct advance in Chain Grate practice. They secure Ignition—quick and strong, right up at the fuel gate. Sealflex Arches make possible economical burning and high capacities with low grade coals and even lignite. They are readily adaptable to any furnace width and insure uniform ignition the full width. Replacements are easily and quickly made.



"L" Type for Coking Coal

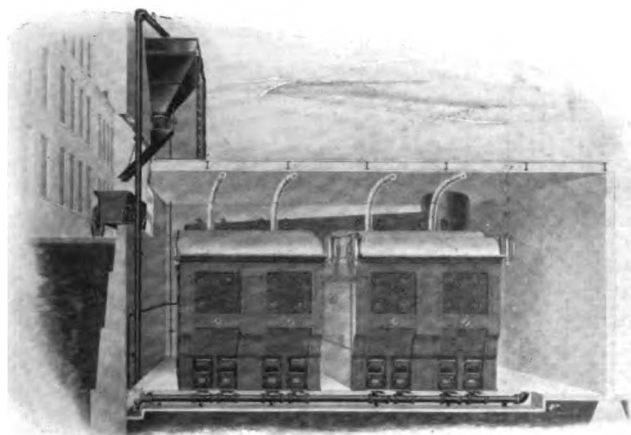
Three Million Horse Power in Service. Write for Catalogue CG-1

GREEN ENGINEERING COMPANY

GREEN STEAM JET ASH CONVEYOR

for

Hand and Stoker Fired Plants



Green Steam Jet Ash-Handling Systems consist of hard **Geco Metal Conveyor Pipe** located within or in front of ash pits. Inlet openings are provided at each ash pit into which ashes may readily be drawn.

Conveyor Pipe may be connected at any angle, elevation or level between the receiving intakes and the point of discharge, making the system adaptable to any building construction and allowing location of storage where most convenient for disposal to wagons or cars.

Conveyor Pipe has ground joints which insure air tightness and no steam wastage. Suction is produced by Steam Jets which are placed in elbows where angles in the pipe line occur. Dust, obnoxious gases and fire hazard, the three annoyances heretofore resulting from handling ashes, are all eliminated. Dust and gases are drawn in by the suction at the intakes, and no fire hazard exists as water is sprayed into the conveyor pipe, thoroughly and automatically quenching the ashes during transit and before being discharged to storage.

Green Steam Jet Systems are positive and simple to operate, requiring only the turning of a steam and a water valve. Ashes drawn into the intakes are instantly conveyed and discharged either into a storage tank, directly into cars, or to ash pile. Storage tank may be either cast iron, wood, concrete or steel construction.

Geco Metal used in this conveyor is extremely hard and wear-resisting, insuring long life and low maintenance. Provision is made for quickly renewing at small cost, parts subject to the greatest wear.

Green Steam Jet Systems contain no machinery or moving parts. Their simplicity insures cleanliness, reliability and maximum capacity with minimum power, minimum labor and absolute safety to both workmen and property. No adequate comparison can be made with other methods of handling ashes.

Write for Catalogue SJ-1



MURPHY IRON WORKS

FOUNDED 1878

DETROIT, MICHIGAN

Manufacturers of the Murphy Automatic Furnace

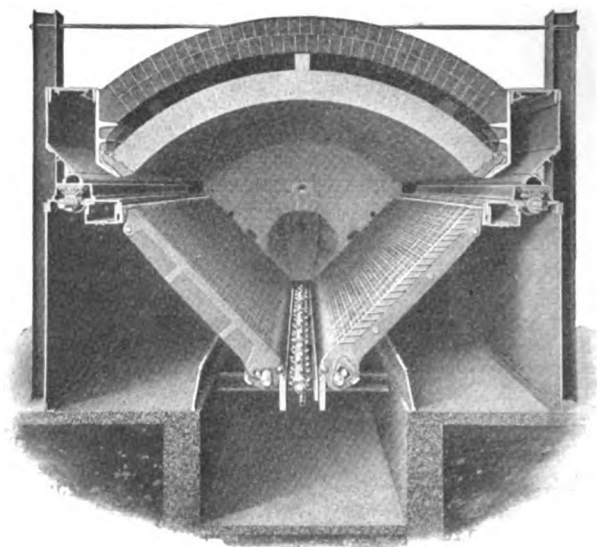
THE MURPHY AUTOMATIC STOKER is automatic in all its functions. It feeds and distributes the coal and removes the ash and refuse.

It is adaptable to any type of boiler and to units of any size.

It will handle economically all grades of bituminous fuels and is practically smokeless under normal operating conditions.

It is capable of handling variable loads and heavy overloads efficiently and with minimum attention.

The cost of maintenance is low, averaging about 10c. per horsepower per year.



The Murphy Automatic Smokeless Stoker

REAR VIEW

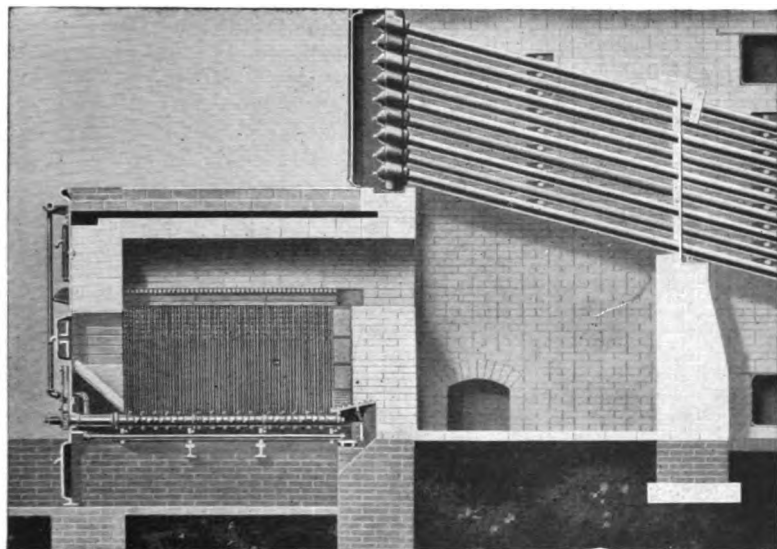
In cost of operation the Murphy stoker demonstrates especially the advantages of over 38 years of stoker experience.

Refinements in design and construction have reduced the cost of operation to the lowest limit.

The arrangement of the grates, commonly known as "opposed type," offers many advantages. There is no loss of heat due to radiation through side walls and the use of air brought through the arch helps the further saving of heat units.

The cost of operation is less than 1% due principally to the use of natural draft, balanced mechanism and little friction.

MURPHY IRON WORKS



Murphy Stoker—Dutch Oven Setting

83

At either side of the stoker extending from front to rear is the coal magazine into which the coal may be introduced either by hand or mechanically. At the bottom of this magazine is the coking plate against which the inclined grates rest at their upper ends. The stoker boxes, operated by segment gear shafts and racks, push the coal over the coking plate and on to the grates. The grates are made in pairs, one fixed and the other movable. The stationary grates at their lower ends rest on the grate bearer, which also acts as a support for the clinker grinder. The clinker grinder consists of a steel shaft, on to which is slipped cast iron toothed segments, which are readily replaced in case of breakage.

Just over the coking plate is the arch plate, from which a fire brick arch is sprung over the entire stoker. Upon this arch plate are cast numerous ribs to form a series of air ducts immediately over the coking plate, conveying the heated air from the chamber above the arch into the combustion chamber. This arch plate also forms the wall of the magazine. The stoker, or battery of stokers, can be operated by a small automatic engine, motor or by overhead shaft and ratchet drive, as may be desired. Arrangement is made for exhaust steam connections at the lower end of the grates for the protection of this portion of the grates and clinker grinders and for the softening of the clinker. In connection with horizontal tubular boilers or water tube boilers horizontally baffled, the Murphy stoker can be installed with a flush front setting. Arrangement can be made for extended or Dutch over settings, should this be desired.



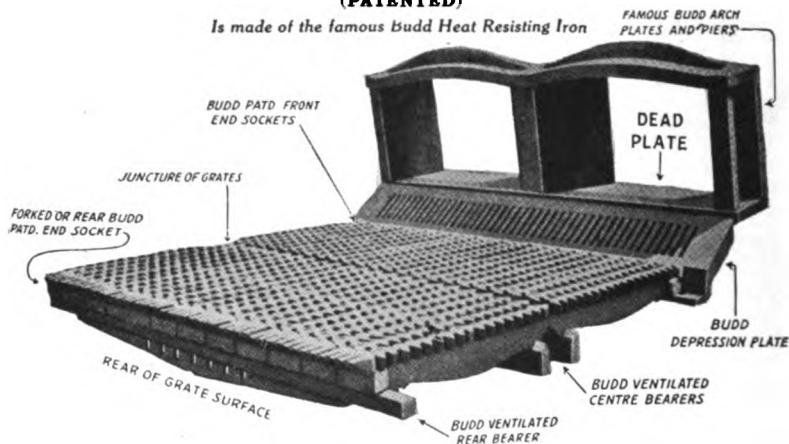
THE BUDD GRATE COMPANY

OFFICES: 2013 E. LETTERLY ST., PHILADELPHIA, PA.

WORKS: ADAMS TO LETTERLY STS.

Manufacturers of Budd Boiler and Furnace Equipment
Aluminum, Iron and Brass Foundries. Machine and Pattern Works

THE BUDD STATIONARY GRATE AND EQUIPMENT (PATENTED)



The above cut illustrates the Budd Equipment. Observe that the grates are placed at sufficient distance from the ends of the bearing bars and depression plate as to allow for the bearing bars to be bricked in the side walls.

Budd Arches are made special and will therefore fit any firebox. The centre pier, the casting between the two side piers and which is placed on the dead plate, is not cast solid but is made of metal 2 inches or thicker, when required, and the inside of the same is hollow, which naturally gives ventilation and acts as a preventative to the heat. The side liners or side piers are also ventilated as shown. The arch in the above cut is cast in two pieces, effecting ease in installation. The heavy rib on the arch acts as a reinforcement and when installed is embedded in the bricks and this does not bring it in direct contact with the fire.

A rib is also cast on the under side of the dead plate. It cannot be seen in the above cut. All the Budd Dead Plates have this rib, insuring long life, non-warping and non-twisting.

The Budd Depression Plate admits the air at an angle and diverts the heat from the boiler front doors and liners, protecting the fireman. By admitting the air at this angle the heat is applied directly to the boiler or tubes and accomplishes results in steam, and increases the air inflow without increasing the firebox space and will burn the smoke. The Depression Plate is equipped with an air shutter operated from the front of the boiler, when it is found necessary to control and regulate the inflow of air.

In the Budd Patented Grates in the above cut each individual bar is made of the standard width of $2\frac{1}{4}$ inches and they are shown inserted in the front and rear end sockets and each pair is resting side by side along the bearing bars and the depression plate. Budd Grates are made of the same design for all kinds of fuels although different patterns are used of various openings so as to meet any fuel condition.

Send for copy of "Boiler Furnace Operation," a concise handbook.

McCLAVE-BROOKS COMPANY

MAIN OFFICE AND WORKS, SCRANTON, PA.

NEW YORK OFFICE
50 Church St.

CHICAGO OFFICE
515 Hearst Bldg.

Manufacturers of McClave's Stoker, McClave's Shaking, Cut-Off and Dumping Grates, McClave's Argand Steam Blower. All Kinds of Iron and Brass Castings

McCLAVE'S SHAKING, CUT-OFF AND DUMPING GRATES

Made in four different types: Nos. 1 and 2 being used principally for soft coal and the larger sizes of Anthracite; Nos. 3 and 4-A for the smaller Anthracite sizes.

McClave Grate No. 1 is our old type of Shaking and Cut-off Grate, in which all of the grate bars are cast integral.

In our new type, **No. 2**, the regular grate bars are made with *Removable Sectional Tops*, with shanks which are mounted in sockets in the pendant body portion of the bars. Cost of repairs is thus reduced to a minimum. These grates have an absolute cut-off movement, in which each row or section can be operated as a whole, or the front and rear separately. In the shaking movement there is no increase in the openings between bars, consequently no waste of unconsumed fuel.

McClave Grate No. 3. Specially adapted to burn the smaller sizes of Anthracite fuel, such as Buckwheat, Birdseye, Rice, etc.

The Grate Bars are constructed with a body portion and *Removable Sectional Tops*, the shanks on the tops being arranged centrally, which makes practically a "T" formation, whereby a double cut-off movement is secured by forming pockets on either side of the bars. Each row can be operated as a whole, or the front and rear separately.

McClave Grate No. 4-A. This is a dumping grate, specially designed to burn the smaller sizes of Anthracite coal. Sectional Removable Tops are made with beveled edges at end, to allow for expansion. Overlapping of edges of bars prevents sifting between the bars. Fitted with twin levers for operating the front and rear series of bars separately.

The mesh or air space in the tops is made as small as $\frac{1}{32}$ " for the very small sizes. The construction as a whole is very strong and durable.

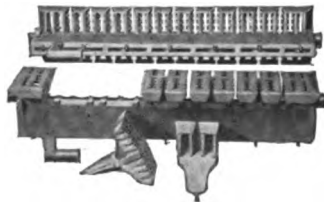
Grate frames are made in one or more rows, as required, with expansion top Journal Bearing Bars reaching from the front to rear of furnace, and having Journal Locks which fit over the journals of the Grate Bars, to prevent the bars from lifting out of their bearings when they are being operated.

McCLAVE'S ARGAND BLOWER

The result of over thirty years' experience with the problem of more effectually burning the cheaper grades of Anthracite and Bituminous fuels. Gives a properly proportional combined air and steam blast, and forms a complete system when used in connection with McClave Grates. Large volume of air with small steam consumption guaranteed. Practically noiseless in operation. Automatic Blower Regulator also furnished when desired. Illustration shows new type High Duty Blower installed through side wall of boiler.



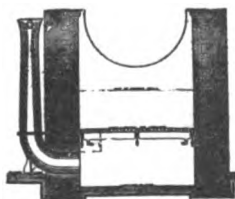
McClave Grate No. 2



McClave Grate No. 3



McClave Grate No. 4-A



THOMAS GRATE BAR CO.

BIRMINGHAM, ALA.

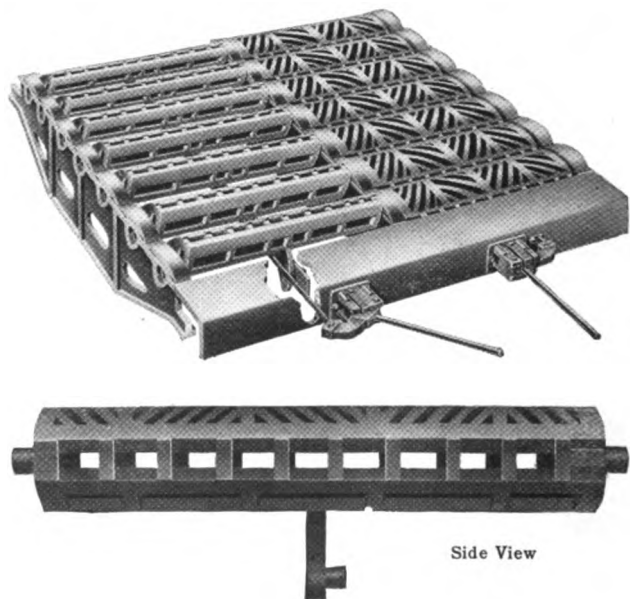
BRANCH SALES OFFICES

Hippodrome Building, CLEVELAND, OHIO

Railway Exchange Building, CHICAGO, ILL.

Manufacturers of Thomas Elliptic Grate Bars for Every Fuel

THOMAS WIGGLING-SHAKING-DUMPING GRATE BARS



FOR USE IN

Locomotives—Steamships—Tugs—Dredges—Loaders—Skidders—Derricks—
Wreckers and Power Plants generally.

Fitted to All Types of Boilers

Water-Tube—Return Tubular—Perpendicular (Circle fire boxes) Locomotive
—Marine—Scotch Marine—Dog House—Dutch Ovens, etc.

Designed for Burning

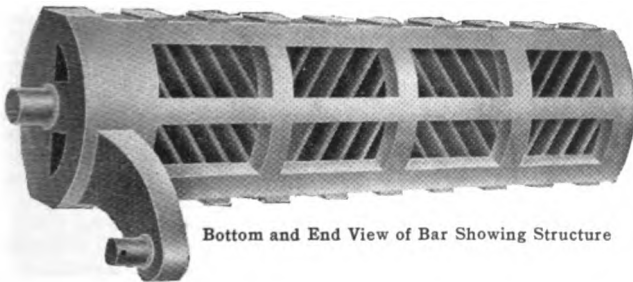
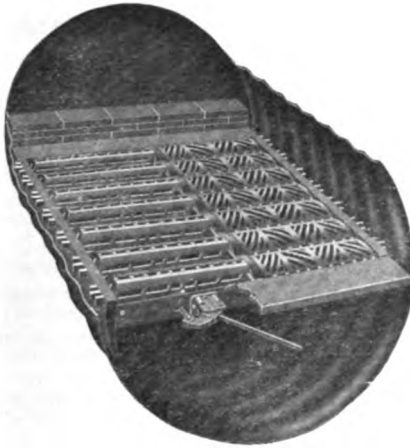
Anthracite—Bituminous—Lignite—Bagasse—Wood—Wood refuse—Sawdust
and shavings, of all grades.

Detailed information upon request.

THOMAS GRATE BAR CO.

THOMAS WIGGLING-SHAKING-DUMPING GRATE BARS

(Patented)



Bottom and End View of Bar Showing Structure

THE BAR

That saves its cost in fuel saved in a few weeks' use.

That eliminates the cleaning period.

That eliminates grate bar mishaps and shut-downs.

That makes a poor steaming boiler a free steamer.

That reduces the fireman's labors.

That cannot get out of fix and refuse to work.

THE WHY

Structure: Is made up of two curves, one top and one bottom, joined together at each side with spacing and connecting lugs of one-third contact and two-thirds air space, forming a structure in which the heat cannot equalize; the under portion cannot get hot to break or become distorted and refuse to work.

Material: Made of pure Pig Iron (no scrap) bought on analysis, standing 2370 degrees before fusing.

Operation: The Elliptic shape, eccentric movement slips under the fuel or fire bed, peels the ash from its lodgment and deposits into ash pit and does not disturb the fire, tearing the fuel bed into streaks, seams, holes and pockets, as other shaker grates do.

Results: The fire is kept at the highest state of efficiency at all times—never fouling, giving more steam and substantial savings in fuel.

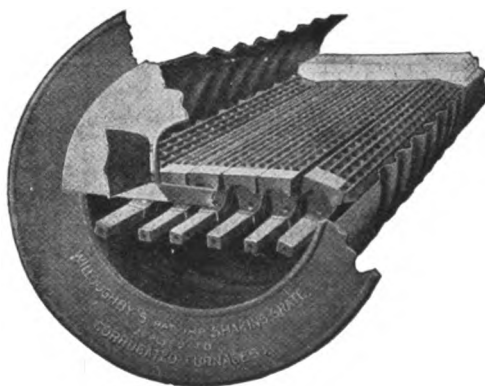
For Use with Either Natural, Induced or Forced Draft

ST. JOHN GRATE BAR COMPANY

MACHINERY DEPT., THE BOURSE, PHILADELPHIA

Manufacturers of Willoughby Patent Furnace Equipment
Consulting and Mechanical Engineers, Experts in Combustion

WILLOUGHBY'S PATENT IMPROVED SHAKING GRATES AND FURNACES



These grates are especially adapted for Internally Fired Corrugated Furnaces, though used to advantage in all kinds of boilers and furnaces, with any fuel, and with natural, forced or induced draft.

Their use does away very largely with the need of "cleaning fires," since the construction and operation is such that all refuse can be broken up and passed through the bars by shaking. These grates have been run seven weeks without cleaning fires, using Pittsburgh coal in internally fired boilers.

CONSTRUCTIONAL FEATURES

These grates run longitudinally, and present a flat surface to fire upon, over which a slice bar or hoe may be used without catching. This is impossible with round or curved top design grates running crosswise.

SUMMARY OF ADVANTAGES

The most business-like grate on the market, absolutely "fool-proof."

It is simple in construction. Easily operated.

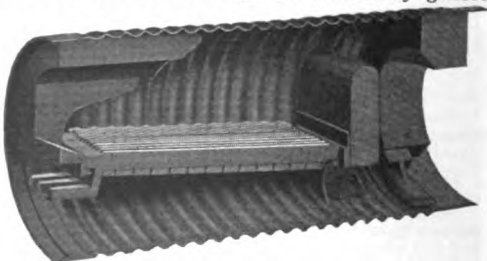
It will reduce your coal bills. Adapted to any style furnace.

Adapted to either hard or soft coal. Will reduce the clinker to a minimum.

Increased air space. Will improve the efficiency of your boiler.

Cleanings are reduced to a minimum, and doors kept closed longer than with any other method.

Guarantee: With the installation of the WILLOUGHBY PATENT IMPROVED SHAKING GRATES, we will guarantee the ability to develop twenty-five per cent higher capacity than can be secured from flat stationary grates under like conditions, or, we will guarantee the ability to develop the same capacity as you now secure (from flat grates) on at least ten per cent less fuel under like conditions on a twenty-four hour (or longer) run. Provided: an evaporation test be made with both flat grates and this grate in the presence of our representative.



Expert advice as to necessary requirements for the most efficient combustion of Bituminous Coal. Stationary Grates of approved design for all Fuels.

WASHBURN & GRANGER

50 CHURCH ST., NEW YORK, N. Y.

BOSTON, MASS.

PHILADELPHIA, PA.

Manufacturers of the Dean Dumping Grate, the Dean Shaking Grate, the Dean Furnace, Dean Fire Brick Linings, Incinerators and Destructors, Boiler Fronts and Furnace Castings, Floor Plates, Industrial Railways, Turntables

DEAN DUMPING GRATES

Built for burning the small sizes of Anthracite coal with either natural or forced draft. Bars tip in tandem to an angle of sixty-five degrees and are supported at both ends by a rectangular frame which eliminates entirely the tendency of the bars to hang downward on the ends. Air spaces $\frac{1}{4}$ " to $\frac{3}{8}$ " slot and also built in the pin-hole form with $\frac{1}{4}$ " or $\frac{5}{16}$ " diameter openings. Fires can be cleaned in one-half the time required with stationary bars. Catalogue No. 7 on request.



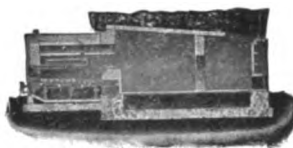
DEAN SHAKING GRATES

Used for Bituminous and the larger sizes of Anthracite coal, both fuels requiring a grate with an oscillating or shaking movement. Supported by a frame resting on the ash-pit floor independent of the brick work with bars placed on 8" centers, allowing ample opening for the largest clinkers. Journals self-locking, requiring no caps. The sides of the bars are made solid which is a necessity as ninety percent of the wear comes along these edges. Construction is of the most durable form, to withstand hard service. Catalogue No. 7 on request.



THE DEAN FURNACE

An efficient hand-fired furnace designed for small and medium size plants and built with large refractory surfaces, has a ventilated arch to admit preheated air over the rear of the furnace and also additional air openings in the side walls of the setting. Built without the use of steam jets to eliminate smoke and provided with twin arches in the combustion chamber and Dean Shaking Grates. Complete booklet describing this furnace in detail will be sent on request.



DEAN FIRE BRICK LININGS

Manufactured to withstand furnace temperatures of thirty-two hundred degrees from Pennsylvania flint and New Jersey plastic clays. Standard side and bridge wall blocks are made 24" long, 18" high and 8" thick with tongue and groove ends and are carried in stock for immediate shipment. The use of a block of this size eliminates the large number of joints required with standard fire brick construction and also the tendency of the furnace walls to burn out. We also build jambs and arches for all types of fire doors. Send for our catalogue No. 5 on "Refractories for Boiler Furnace Linings."



INCINERATORS AND DESTRUCTORS

We have patterns and designs for incinerators for burning rubbish and waste material, suitable for institutions, hotels, schools, apartment houses, museums, factories, etc.

We build garbage destructors of the brick set type suitable for large hospitals and hotels and a portable type for use in large residences, clubs, restaurants, etc., designed with a steel casing and lined with fire brick to be operated with coal or gas as fuel. Send for catalog No. 8, "Dean Incinerators."



FULLER-LEHIGH COMPANY

(Successor to Lehigh, Car, Wheel & Axle Works)

FULLERTON, PENNA., U. S. A.

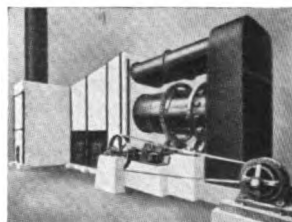
Manufacturers of Pulverized Coal Equipment, Crushers, Dryers, Car Wheels and Axles, Chemical Castings, Special Castings in Green Sand or Loam, Etc.



Lehigh Crushing Rolls



**Fuller Mill,
Pulley Driven**



Indirect Fired Rotary Dryer

PULVERIZED COAL EQUIPMENT

Design

**Superior in
Efficiency**

Performance

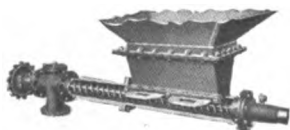
We are in position to furnish all the various units used in connection with furnaces heated by means of pulverized coal. At the present time our Pulverized Coal Equipments, consisting of Lehigh Crushing Rolls, Indirect Fired Rotary Dryers, Fuller-Lehigh Pulverizer Mills, Pulverized Coal Feeders, and Fuller Quality Sprocket Wheels, are installed in plants having a capacity of 25,000 tons of pulverized coal per day. These plants are widely distributed and are pulverizing coal obtained from a large number of fields in various coal-producing districts.

The types of furnaces heated with Pulverized Coal are quite diversified, and we enumerate below some of the furnaces at present heated by means of this most economical and efficient fuel in order to convey some idea of the wide application of Pulverized Coal for heating various types of Industrial Furnaces.

Annealing Furnaces
Bar Heating Furnaces
Billet Heating Furnaces
Calcining Furnaces
Drying Furnaces
Forge Furnaces
Locomotives
Nodulizing Furnaces

Open Hearth Furnaces
Ore Roasting Furnaces
Piled Scrap Heating Furnaces
Puddling Furnaces
Rotary Cement Kilns
Rotary Lime Kilns
Steam Boiler Furnaces, Marine
and Land Type

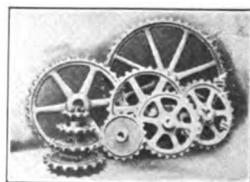
Send for Illustrated Catalogue No. 71.



Pulverized Coal Feeder



**Fuller Mill,
Gear Driven**



Face Hardened Sprocket Wheels

LOCOMOTIVE PULVERIZED FUEL CO.

30 CHURCH ST., NEW YORK

CANADIAN OFFICE: MONTREAL

Foreign Agency

INTERNATIONAL PULVERIZED FUEL CORPORATION

FUEL PREPARING PLANT

We deliver in operation, complete fuel preparing, distributing, feeding and burning installations for locomotives, stationary and marine boilers, metallurgical and chemical furnaces and cement kilns.

As each installation involves distinct problems every plant is designed to meet local fuel, operating, and production conditions, thereby insuring the most successful results.

We make a thorough study of each installation.

DISTRIBUTING SYSTEM

Universally used Screw Conveyors and Bucket Elevators, when handling pulverized fuel, require the minimum power for operation and the least cost for upkeep.

Lopulco Distributing Systems meet all requirements of insurance underwriters.

FEEDING EQUIPMENT

Standard "Lopulco" Feeder as illustrated, insures against clogging and flooding; and provides uniform delivery and positive mixture of requisite fuel and air for quick ignition and temperature regulation. Eliminates pulsation and produces steady short



flame at burner outlet resulting in complete combustion and less fuel consumption. Individual feeder capacities range from 50 to 4000 lbs. per hour.

BURNERS

Several types of "Lopulco" burners have been developed to meet every operating requirement and make coal as easy to handle as oil or gas. By producing a soft and less gassy heat, furnace, boiler and shop output is increased.

Send for our Bulletins and Engineering Inquiry Sheets and let us give you preliminary information.



QUIGLEY FURNACE SPECIALTIES COMPANY, INC.

MAIN OFFICE: 26 CORTLANDT ST., NEW YORK CITY

BRANCH OFFICES: Oliver Bldg., PITTSBURGH, PA.

Dry Milling Engineering Co., DENVER, COLO.

**Engineers, Designers and Contractors of Complete Powdered Coal Equipments
Including Furnaces**

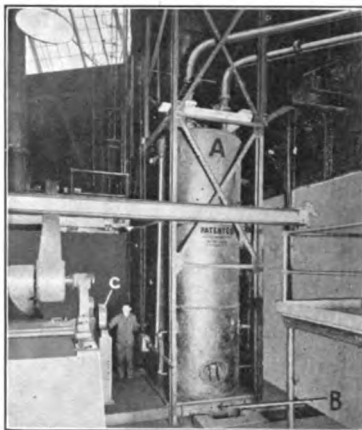
Also Makers of HYTEMPITE Furnace Cement

QUIGLEY PATENTED SYSTEM OF POWDERED COAL EQUIPMENT

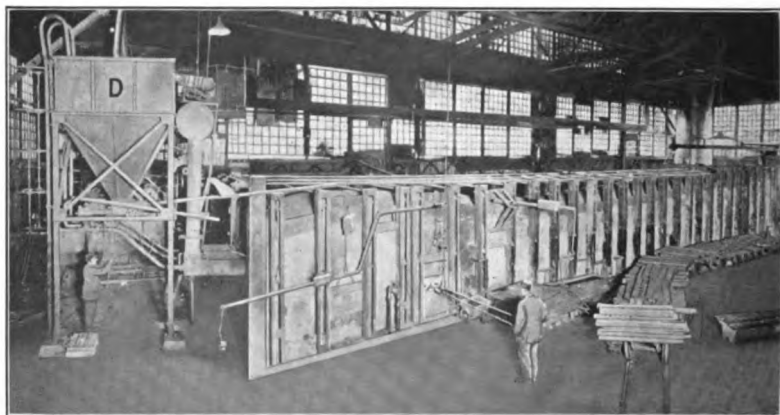
With our improved method of burning powdered coal, the fuel is automatically weighed as sent to the furnace bins. Transportation of the fuel is through wrought pipes to the furnace bins which may be in widely separated departments.

The system of distribution consists of pipes with switching valves conveniently located, the turning of which diverts the coal to bin or bins as desired. These bins are located at the furnaces with an ample fuel supply for 10 to 24 hrs. The controller used to regulate the fuel feed is of simple design having only two working parts but is positive in action.

The fuel is fed by the controller through a moving screen into a low pressure air system which carries the fuel into the burner where it is mixed with the larger volume of combustion air at a pressure just above atmosphere, thus securing the lowest velocity and most nearly perfect combustion.



Powdered Coal Blowing Tank



70 Foot Billet Heating Furnaces

Send for illustrated bulletin.

HAMMEL OIL BURNING EQUIPMENT COMPANY, INC.

SALES OFFICE EAST OF MISSISSIPPI RIVER
409 Pine Street
PROVIDENCE, R. I.

WEST OF MISSISSIPPI RIVER
640 North Main Street
LOS ANGELES, CAL.

Products: HAMMEL OIL BURNERS; HAMMEL PATENT OIL BURNING FURNACES; OIL PUMPING SETS.

Also, Hammel Special Designed Oil Burning Furnaces; Hammel Oil Firing Valves; Automatic Pump Governors; Oil Strainers; Fuel Oil Heaters; Oil Burner Governors and Draft Gages.

HAMMEL OIL BURNERS

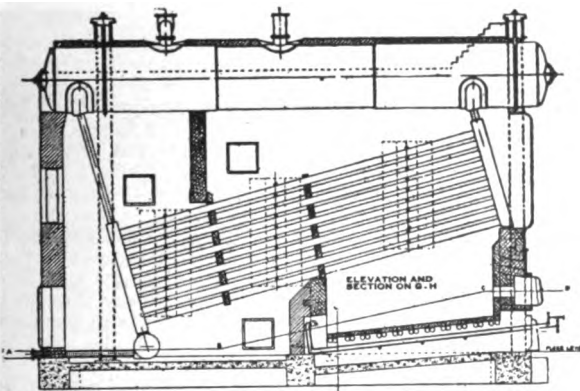
The Hammel oil burner is of the inside mixer type and built upon scientific principles. The features which distinguish the Hammel as an ideal oil burner are that, in normal service, it will not carbonize; parts subject to wear, due to grit in oil, can be easily renewed; heavy Mexican oil is burned with perfect results.

THE HAMMEL OIL BURNING FURNACES

The proper design of furnace is of supreme importance as determining the efficiency and capacity of boiler, and immunity from boiler injuries and shutdowns. Brick arches, bridge walls and target walls are not only needless in securing high boiler efficiency, but are a menace to the continuity of operation. The Hammel Company, after years of experimenting and diligent study, have developed oil burning furnaces for the different types of steam boilers, which not only eliminate the defects encountered in the ordinary improvised furnaces, but represent the highest development so far attained in this particular branch of engineering.

The Hammel patented furnaces for the Babcock & Wilcox and Stirling boilers, and the Hammel patented double burner system for locomotives, also the Hammel special designed furnaces for Return Tubular, Scotch Marine, Locomotive, and the various types of water tube boilers, when provided with the Hammel Oil Burner, make an unbeatable combination.

The Hammel Patent Oil Burning Furnace as applied to the Babcock & Wilcox and Stirling water tube boilers represents the most important advance yet made in burning oil under boilers of this character. It enables these boilers to be operated at a considerable increase in capacity and economy without smoke or burning of tubes. The results shown have not been equalled by any other system.



The Hammel Patent Oil Burning Furnace

ADVANTAGES OF THE HAMMEL OIL BURNING FURNACES

Greater economy.

High efficiency.

Ability to develop greater overloads.

Perfect combustion.

Furnace upkeep cost reduced to a minimum.

Simplicity of construction.

More even distribution of the heat.

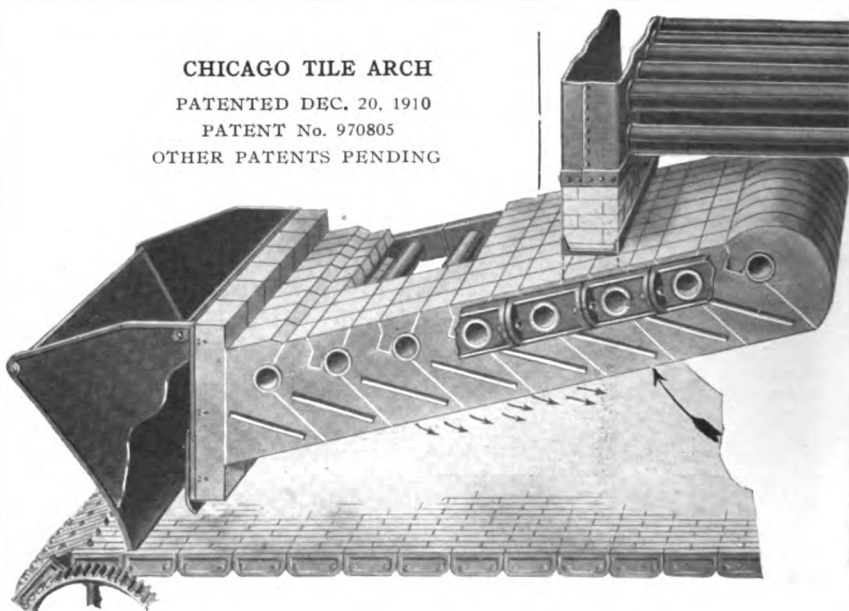
CHICAGO TILE ARCH FURNACE CO.

GENERAL OFFICE AND WORKS:
321-323 West Austin Avenue
'Phones, Franklin 1949-3056

} CHICAGO {

SALES OFFICE:
1160 Monadnock Block
'Phone, Harrison 4626

CHICAGO TILE ARCH
PATENTED DEC. 20, 1910
PATENT No. 970805
OTHER PATENTS PENDING



96

IT IS EASILY AND QUICKLY REPAIRED BY REGULAR boiler-room help.

Supported entirely by the side walls. Each tile is independently suspended.

One or more tile of an arch can be renewed without moving or interfering with any adjoining tile.

The simplicity of the rear end of the termination of the arch, like the entire arch, requires no protection from the flames for its suspension unit, the suspension pipe being completely covered by the tile.

Whether assembled in a horizontal or an inclined arch, the tile, owing to its manner of suspension and characteristic form, has a "clinging" effect one to the other, resisting the effort of gravity.

This is further augmented by having an interlocking feature consisting of companion tile being moulded, one containing a tongue and the other a groove. These features make for the retention of a tile, in position, should it be broken at the suspension point or midway through the tile.

Renewals of tile are made by inserting the tile underneath the suspension pipe and locking it in place by dropping in the small tile key, directly over the suspension pipes.

The suspension pipe serves the double purpose of suspending the tile and supplying highly heated air to the furnace. The air is carried through the pipe from the outside of the setting and sprayed into the furnace by means of small ports in the bottom of the pipe, which ports are in alignment with a small fissure in the tile.

No additional head room is necessary other than that required by the depth of the tile.

By the adoption of this arch, many poor conditions now existing, wherein furnace height is not sufficient, may be corrected.

M. H. DETRICK CO.

549 W. WASHINGTON ST., CHICAGO, ILL.

Manufacturers of Flat Suspended Fire-Tile Arches

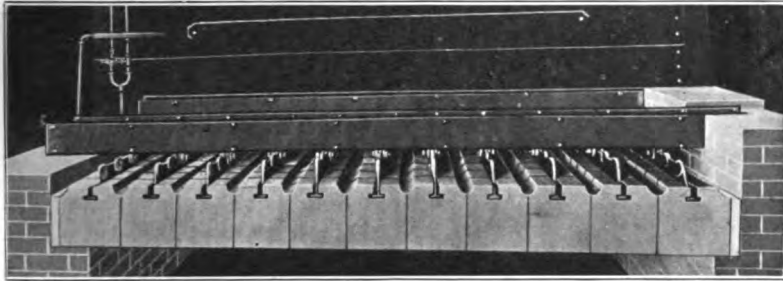
DISTRICT SALES OFFICES

CHICAGO MILWAUKEE ST. LOUIS DETROIT CINCINNATI CLEVELAND NEW YORK
PHILADELPHIA PITTSBURGH BOSTON INDIANAPOLIS SALT LAKE CITY NEW ORLEANS

DETRICK FLAT SUSPENDED ARCHES

Applied to

All Types of Boilers and Stokers



Front View Showing Application of Detrick Flat Suspended Arch to Chain Grate Stoker

The freely suspended individual tiles can move under expansion stress, thereby relieving the side walls from side thrust entirely. Any tile can be replaced when necessary without disturbing the balance of the construction. The flat under surface provides a more uniform distribution of the gases and maintains a higher temperature for the burning of the mixture of air and volatile gases.

97



View Showing End Construction

The end construction shown in the accompanying view is a unique feature in providing the following essentials:

1. Practical apron wall support.
2. Flexible construction, allowing easy repairs.
3. Unit system of suspension.

There is a reason why over 1,000,000 boiler horse power are equipped with Detrick Flat Suspended Arches.



Descriptive Literature on request.

CELITE PRODUCTS COMPANY

NEW YORK
11 Broadway

CHICAGO
Monadnock Bldg.

PITTSBURGH
Oliver Bldg.

LOS ANGELES
Van Nuys Bldg.

SAN FRANCISCO
Monadnock Bldg.

Producers of SIL-O-CEL for Insulation of Heat and Cold, Fireproofing and Sound Deadening



SIL-O-CEL
MADE FROM CELITE

INSULATING BRICK, POWDER AND CEMENTS possess unusual heat insulating qualities, due to their light weight and cellular nature. Made from Celite, Sil-O-Cel is almost pure silica making it possible to subject it to temperatures which would entirely destroy other forms of insulation.



When placed between the refractory lining and outer shell of all forms of heated equipment, SIL-O-CEL Insulation prevents heat loss and increases the capacity of the equipment.

To meet various conditions SIL-O-CEL Insulation is prepared in the form of bricks, blocks, powder and cement.

98

STANDARD SIL-O-CEL INSULATING BRICK are 9" x 4½" x 2½". Arch, wedge, split, and soap brick are also carried in stock. Special sizes and shapes are made to meet any requirement. Standard Sil-O-Cel Brick weigh about 2 pounds each, or about 30 pounds per cu. ft. Their crushing strength is 400 pounds per sq. in.

SIL-O-CEL POWDER is recommended for heat insulation where it is impracticable to use Brick. It is sufficiently elastic to absorb strains caused by expansion and contraction between refractory lining and shell. When packed to a density of 15 pounds per cu. ft. vibration or heat will not cause it to settle or shrink.

SIL-O-CEL INSULATING CEMENTS are used for covering irregular heated surfaces, such as flues, breechings, boiler drums, etc. They are applied in three forms—first, a sticking coat; second, the insulating coat; third, a hard finish coat. These cements possess good insulating value and are more refractory and durable than the usual insulating mixture.

Prevent heat loss and increase the output of heated equipment with Sil-O-Cel Insulation. It saves fuel, betters working conditions and insures more accurate control of temperature. It is applicable to

Boiler Settings
Breechings
Waste Heat Boilers
High Temperature Flues
Pipe Covering
Hot Blast Stoves
Hot Blast Mains
Bustle Pipes
Metal Mixers

Hot Metal Cars
Regenerators
Soaking Pits
Heat Treating Equipment
Annealing Furnaces
Annealing Pits
Malleable Furnaces
Electric Furnaces
Enameling Ovens

Japanning Ovens
Core Ovens
Dryers
Bakers' Ovens
Dust Catchers
Kilns
Oil Stills
Gas Generators
Gas Producers

Bulletins containing Engineering data on any of the above types of equipment will be sent upon request. Detailed information on any specific heat insulating problem will be furnished by our Engineering Department.

JOINTLESS FIRE BRICK CO.

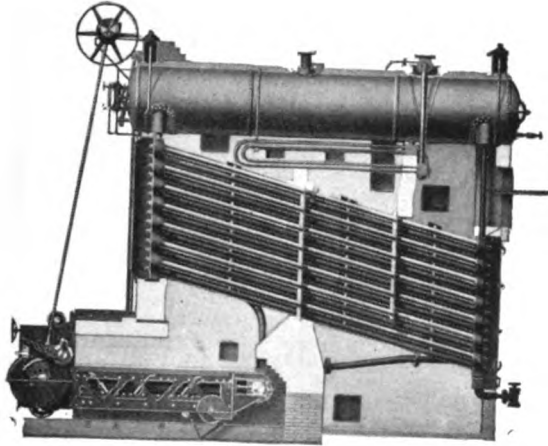
1879 KINGSBURY St., CHICAGO, ILL.

END YOUR
BOILER TROUBLES

PLIBRICO

A High Grade
Refractory

1. It's jointless.
2. It's plastic.
3. It's air and gas tight
4. It will stand 3100° F.
5. It will save fuel.
6. It can be installed by inexperienced labor.
7. It will outlast fire brick.



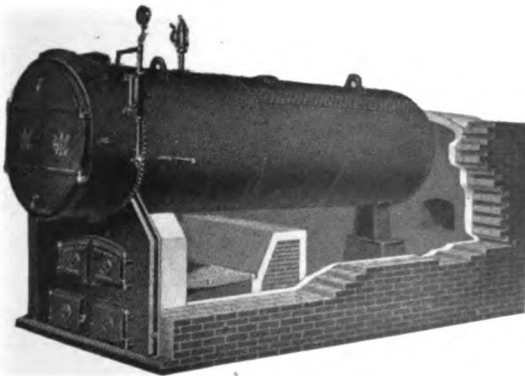
INSTEAD OF first baking fire bricks and laying them up with fire clay joints,

WE APPLY our putty form PLIBRICO (fire brick material), shape it not less than 4½ inches thick, and then bake it out in a one-piece monolithic vitrified finished furnace lining without any joints, and making the fire brick setting air and gas tight.

ANY ENGINEER can see the economy and efficiency of such a lining.

IT PUTS your boiler in "Class A-1."

Try Plibrico on your front door arches and bridge walls or side walls, and we are certain that the economy demonstrated will induce you to use PLIBRICO wherever possible in your plant.



*Write for full details
and send us your blue
prints so that we may
estimate on your furnace
requirements.*



QUIGLEY FURNACE SPECIALTIES COMPANY, INC.

26 CORTLANDT ST., NEW YORK

Manufacturers of HYTEMPITE Furnace Cement
Also Quigley System of Powdered Coal Equipment

THINGS YOU SHOULD KNOW ABOUT

HYTEMPITE

What is it?

HYTEMPITE is a scientifically compounded refractory plastic material for bonded fire brick and kindred uses.

What does it do?

HYTEMPITE forms a lasting union between the materials to be joined, sets at normal temperatures and retains its strength regardless of the heat it is subjected to up to about 3000° F. or a temperature at which the best quality fire brick loses its strength and becomes soft.

Why is it better than fire clay?

HYTEMPITE is better than fire clay because fire clay and water has no binding strength, does not support the brick work or knit together the materials with which it is used, comes loose from constant expansion and contraction, disintegrates or falls out, forming crevices or cracks and does not maintain a gas or air tight structure.

Does it depend on heat for a bond?

No, HYTEMPITE air sets at normal temperatures, making a wall of uniform strength throughout.

Will it stop or prevent air and gas leaks?

Yes, HYTEMPITE will not only stop these leaks, but will withstand the expansion and contraction caused by heat without loosening.

What proves its merit?

Over 80% of its sales are repeat orders.

What are some of its uses?

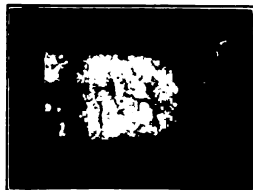
1. For laying fire brick and tile.
2. For tightening old walls and arches, sealing openings in new walls, stacks, etc., to make them air tight, lining doors, etc.
3. Hot patching in furnaces, gas retorts, etc.
4. Making special tile and shapes with crushed old fire brick or carborundum fire sand.
5. Making rammed-in linings with your crushed old fire brick or carborundum fire sand.
6. Bonding new courses or a veneer of fire brick to old walls.
7. Preventing leaks between bricks and iron work.
8. As a wash for surfacing brick work.
9. As a grout diluted or neat, according to requirements.
10. For lining ladles.
11. For patching or building up tuyeres, etc., etc.



Bridge Wall in Boiler Laid with
Hytempite



Pit Crucible Furnace Relined
with Hytempite and Carbo-
rundum Rammed-in



Furnace Door Repaired with
Hytempite



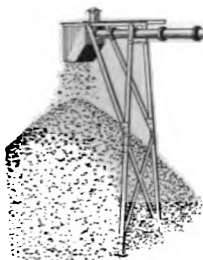
Ramming Lining in Open
Flame Melting Furnace



AMERICAN STEAM CONVEYOR CORP'N

CHICAGO: 326 West Madison Street NEW YORK: 50 East 42nd Street

Engineering and Sales Offices in Other Principal Cities



ASH DISPOSAL ENGINEERING

The ash disposal problem is one of no small importance these days. Incidentally, it's no small problem.

There are any number of things that must be taken into consideration. What would work perfectly in some plants would be altogether wrong in others. There is no one system that can be universally applied.

The AMERICAN STEAM JET CONVEYOR

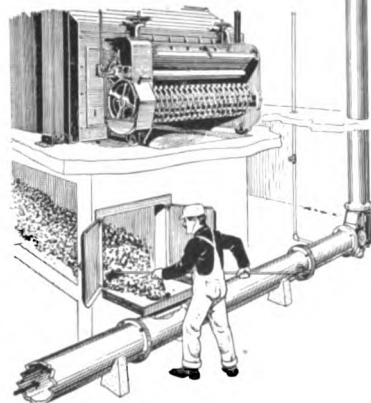
is beyond a shadow of a doubt the ideal system where conditions fully warrant its installation. With it a few minutes of one man's time and a little steam will suffice for the disposal of a day's accumulation in the ashpit. This system releases men from ash wheeling for work where you need them. It has cut from one to three salaries off many a boiler room payroll. You may think it's right for your plant—or you may think it isn't; but why guess at it? Let us investigate—at no cost to yourself. We will tell you positively whether it is or not, and explain exactly why.

Our staff of engineers have for many years specialized on ash and soot disposal plans and nothing else. No matter what type or capacity of equipment your requirements may call for—we are prepared to adapt the proper system to meet the needs existing in your plant.

The "American Steam" representative is never predisposed toward any one type of conveyor. His interest lies in studying carefully your boiler room layout and recommending the one best suited to it. His function is not to sell you as much as he can, but to help you determine how little equipment will do the work efficiently.

Why not allow him to investigate? It will impose no obligation on you.

*Write for Catalog A and Book on
"Modern Methods of Ash Disposal."*



Steam Jet Ash Conveyors
Skip Hoists
Bucket Elevators
Mechanical Conveyors
Monorail Systems
Telescoping Ash Hoists
Crane Hoists

Ash Pit Doors
Locomotive Cinder Pit Ejectors
Locomotive Sand Handling Systems
Marine Ash Ejectors
Ash Cars
Special Hard Metal Castings

DODGE SALES & ENGINEERING CO.

Distributor of the products of

DODGE MFG. Co., MISHAWAKA, IND.

15 Branch Warehouses in the United States.

Dealers in Every Representative City

THE EUREKA WATER SOFTENER

In converting water into steam there is, under the most favorable conditions, a great waste of heat energy. To minimize this loss has been the aim of mechanical men and inventors ever since the adoption of steam as a motive power.

Practically all natural waters are impregnated, to a greater or lesser extent, with soluble metallic salts, which tenaciously attach themselves to the boiler tubes and shell as the water is evaporated into steam, thus forming a cement coating, that not only persistently resists removal, but is also a non-conductor of heat.

Scale $\frac{1}{8}$ inch thick is very common in boilers and appears to be insignificant, yet careful experiments have demonstrated that even such a thin layer of average composition causes a loss of 9% in heating power, which rapidly increases as the layer thickens between cleanings.

Mechanical cleaners are expensive to operate, both as to power and labor required and the more inaccessible parts of the boiler are *never* reached. In many plants a force of men are continually at work drilling out tubes.

Exhaust steam feed water heaters can remove from water only the carbonates (lime), as these are held in solution by carbonic acid gas which is expelled by ordinary boiling at atmospheric pressure, and the carbonates, being thus released, are partially precipitated in the heater. The sulphates, however, which form the hardest kind of scale, are not affected in the heater, and pass on into the boiler where they are precipitated by the high temperatures attained under pressure.

Another expensive phase of the water supply problem is found in many localities where manufacturers are unable to use their own well water owing to its extreme hardness, and are forced to buy a high-priced city supply, which, though better than their well water, is far from perfect. The cost of treating such waters is comparatively little, the average water running only about two cents per 1000 gallons for the necessary chemicals.

Practically all water supplies, whether from well, stream or lake, can be reduced to a common uniform degree of softness by the Dodge "Eureka" Automatic Water Softener and Purifier.

The water may be supplied to the inlet tank either by pressure or gravity. A constant head is maintained in this tank, and the weight of the water falling on a wheel, E, furnishes all the power required to actuate the plant.

A portion of this raw water is diverted to a saturator, J, where a clean lime solution of constant strength is manufactured. In our method none of the impurities in the lime come in contact with the water to be treated, thus there are no lime particles to go over into



the piping and boilers. The alkalinity of the purified supply is practically nil, so there is not only no danger of foaming in the boilers, but the water is eminently suitable for all kinds of high-class work, such as in wool scouring, dyeing, bleaching, etc.

A series of spiral plates, N, accelerates the precipitation of the impurities as the water travels upwards after the chemical reaction has occurred. The sludge deposited on these plates gravitates into the cone from whence it is flushed to the sewer by simply opening the valve S for a few seconds daily.

After leaving the spiral accelerators the water passes through a wood fibre filter, A, into reservoir Y, from which point it is drawn off for use, all scale-forming matter, mud, etc., having been removed.

The machine starts and stops automatically as water is required and will supply any quantity up to the rated capacity. The only attention necessary is about 20 minutes daily, which can be given by the engineer or other employee without interference with his regular duties. It is never necessary for any purpose whatsoever to enter the machine.

Further particulars will be furnished upon application.

WM. B. SCAIFE & SONS CO.

Founded 1802

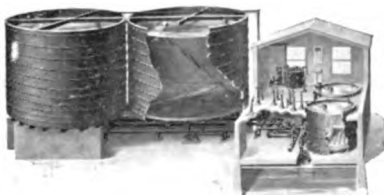
PITTSBURGH, PA.

Water Purification for All Purposes: Continuous and Intermittent Water Softening and Purifying Systems; Pressure and Gravity Filters and Filtration Systems

SCAIFE WATER SOFTENING AND PURIFYING SYSTEMS

The fundamental features of all our designs of systems are—accurate chemical treatment, thorough mixture of reagents with water, accelerated chemical reaction, rapid sedimentation, and perfect clarification. Design for each installation and performance guarantees are based upon scientific investigation of water supply and uses, supplemented by analysis and treatment of water in own laboratory.

We-Fu-Go System—(Intermittent): In this system definite quantities of water are treated, therefore accuracy of treatment can be maintained and uniform water obtained regardless of variations in quality of raw water or rate of use. Consists essentially of two or more reaction and settling tanks, which also act as storage tanks, fitted with mechanical stirring devices operated by power, a small reagent mixing tank, means for introducing the reagents into the reaction tanks, and a quartz filter of either gravity or pressure type. Built for any capacity.



We-Fu-Go System (Patented)



Syphon System (Patented)

Syphon System—(Continuous): An automatic system not dependent upon moving mechanical devices for reagent introduction. The water enters a receiving tank to which is connected a syphon, into the long leg of which smaller syphons connect from the solution tanks. Reagents introduced during the period of syphon discharge. This system can be arranged to be operated either from the ground or from the top.

In addition we manufacture three other standard continuous systems and design special systems where required.

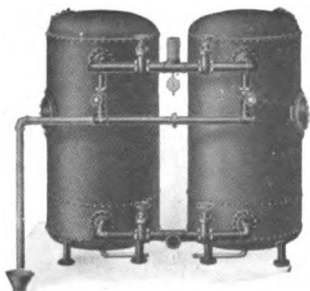


PRESSURE AND GRAVITY FILTER SYSTEMS

Pressure Filters are adaptable for every purpose and are built in capacities from 20 gallons per hour upward, to withstand any required pressure. When operated in pairs, each filter is cleaned with filtered water, one filter furnishing the water for cleansing the other.

Gravity Filters are built in units with capacities varying from 8,000 to 1,000,000 gallons per 24 hours each. Combinations for practically any capacity with required sedimentation can be furnished.

Patented brass conical strainers and patented valveless coagulant feed apparatus are special features embodied in these filters and filter systems.



Pressure Filters

HARRISON SAFETY BOILER WORKS

3130 N. 17TH STREET, PHILADELPHIA, PA.

Manufacturers of Cochrane Feed Water Heaters, Steam and Oil Separators, Multiport Valves, Metering Heaters, Sorge-Cochrane Hot Process Feed Water Softeners, Etc.

WE CAN HELP YOU IN MEETING THE REQUIREMENTS OF THE U. S. FUEL ADMINISTRATION:

Among the things which the Administration recommends are:

The testing of boilers and furnaces and the maintenance of a boiler room accounting system. (For boiler testing and accounting a Boiler Feed Water Meter, such as the Cochrane, is absolutely essential.)

The utilization of exhaust steam in heating and drying, etc. (Many plants now using live steam for these purposes are at the same time wasting exhaust steam, which would serve equally well after purification by passing through a Cochrane Oil Separator, either independent or forming part of the Cochrane Feed Water Heater.)

The treatment of the boiler feed water. (Scale-forming or corrosive boiler feed water wastes fuel and wastes money and labor expended in cleaning and repairing boilers. Scale formation and corrosion are both prevented, and fuel is saved, by the installation of a Sorge-Cochrane Hot Process Water Softener.)

Have you an accurate thermometer in your boiler feed line? What temperature does it show? (210° F. is around the minimum if you have a Cochrane Open Feed Water Heater and sufficient exhaust steam. If you are using an old and scale-filled closed heater, or a closed heater of insufficient capacity, the thermometer may read only 150° F. or 180° F. Compared with 210° F., 150° F. shows a waste of nearly 3% of fuel, which is sufficient to pay the annual charges on a new Cochrane Heater.)

Our Engineering Department would be glad to give the benefit of its thirty years of experience in improving boiler plant economy, or we will send upon request our specialized treatises:

**"The Profitable Utilization of Exhaust Steam for Heating,
Drying, Etc."**

"The Design and Use of Steam and Oil Separators."

"The Modern Scientific Treatment of Boiler Feed Water."

**"Finding and Stopping Waste in Modern Boiler Rooms
by Means of Feed Water Meters."**

HARRISON SAFETY BOILER WORKS

3130 N. 17TH STREET, PHILADELPHIA, PA.

Manufacturers of Cochrane Feed Water Heaters, Steam and Oil Separators, Multiport Valves, Metering Heaters, Sorge-Cochrane Hot Process Feed Water Softeners, Etc.



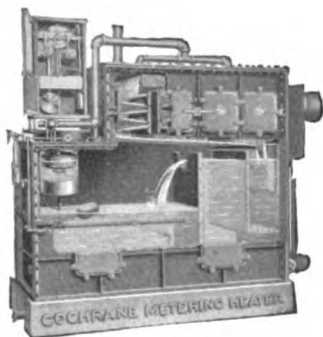
Horizontal Oil Separator

Cochrane Steam and Oil Separators remove liquids and solids from gases or vapors. The Cochrane Oil Separator is guaranteed, when installed according to our instructions, to deliver steam so thoroughly purified of cylinder oil that this steam can be safely used for heating water by actual contact for boiler feed, dyehouse or other uses, or that this steam when condensed will be entirely suitable for similar uses.

The Cochrane Open Feed Water Heater utilizes exhaust steam to heat water for boiler feeding and other purposes.

In connection with exhaust steam heating or drying system, we recommend the **Cochrane Steam Stack and Cut Out Valve Heater and Receiver**, which is fitted with an extra large separator, rendering unnecessary an independent oil separator.

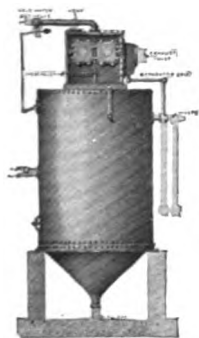
For measuring the evaporation per pound of coal install the **Cochrane Metering Heater**, which performs all the functions of a standard Cochrane Heater, besides accurately measuring the boiler feed water.



Cochrane Metering Feed Water Heater

105

Sorge-Cochrane Hot Process Water Softeners take advantage of the fact that chemical reactions are more rapid and complete in hot water than in cold water, and a higher degree of sludge removal can be guaranteed. The apparatus is most compact and simple and, generally, can be installed within the boiler room, eliminating expense for special foundations or housing. Besides softening the water, it performs all the functions of an Open Feed Water Heater.



Sorge-Cochrane Hot Process Water Softener

Describe your conditions and appropriate literature will be sent.

116

THE NATIONAL PIPE BENDING CO.

MAIN OFFICE AND WORKS
NEW HAVEN, CONN.

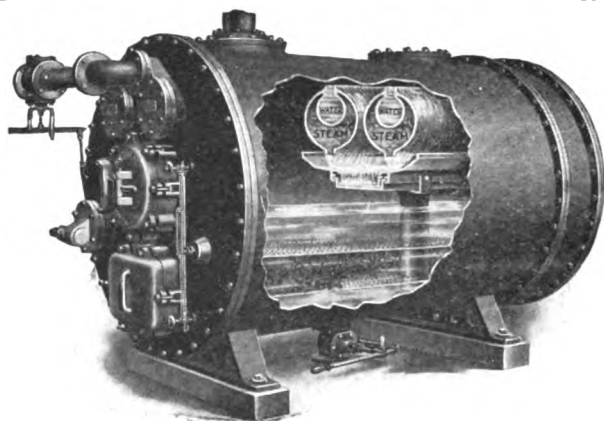
Ruggles-Klingemann Mfg. Co.
10 High St., Boston, Mass.

H. W. Reisinger
710 Park Bldg., Pittsburgh, Pa.

James S. Hamilton Co.
149 N. 7th St., Philadelphia, Pa.

L. C. Holmes
705 Ouray Bldg., Washington, D. C.

Manufacturers of the National Coil or Closed Feed Water Heater. The National Direct Contact Feed Water Heater and Purifier. National Storage Heaters. National Steam and Oil Separators. Coils and Bends of Iron, Brass and Copper Pipe



NATIONAL FEED WATER HEATERS

The feed water is brought to high temperature by direct and actual contact with the exhaust steam, then freed from those impurities which are precipitated by heating, and lastly, filtered before flowing to the pump. It combines in one apparatus a Heater, Purifier, Storage Reservoir and Oil Separator.

The water enters through a regulating valve and is distributed to the smaller or inner pipes which extend the full length of the heater. Overflowing the port at the top, it passes as a thin film over the entire outer surface of the large pipe. During this time it is warmed by the steam in the steam pipe which practically surrounds the water pipe. The exhaust steam after passing through a National oil separator, which forms a part of the heater, escapes from the steam pipe through the port at the bottom and in passing through the curtains of water heats it by actual contact to the temperature of the exhaust steam.

The heated water collects in the tray beneath the pipes and by means of a vertical pipe reaches the bottom of the heater where the scale-forming substances are precipitated. The water then passes upward through the filter material to the hot storage chamber from which the pure hot water blows direct to the pump.

Upward filtration has these advantages: the filtering material needs cleaning or renewal only at long intervals because most of the solids separate out below it, relieving the filter bed of all unnecessary work; in case the perforated plates supporting the filtering material should break, the material will not be carried over to the pump, as would be the case with downward filtration.

A quick-opening blow-off valve at the bottom of the heater affords opportunity to clean the filter bed by reversing the flow.

Described in Catalog No. 52.

THE NATIONAL PIPE BENDING CO.

NATIONAL CLOSED FEED WATER HEATER

For use when the feed water need not be purified. In the National, the feed water is heated while being pumped through a coil of seamless-drawn brass or copper tubing surrounded by exhaust steam. The water is absolutely free from even a trace of oil, for it does not come in contact with the exhaust steam. The brass or copper has no effect on the water.

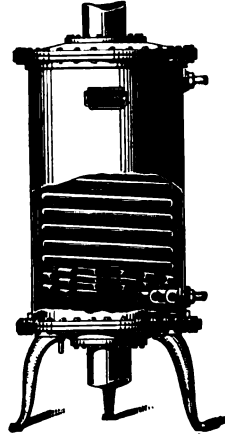
The enclosing shell is of cast iron or steel plate; it lasts indefinitely because the feed water cannot reach it.

The economy resulting from the utilization of exhaust steam varies from 8 to 13 per cent of the coal burned, depending on conditions—temperature of feed water and boiler pressure; but other advantages are reduction of strains caused by feeding cold water, and increase in boiler capacity.

The National is safe—the coils are tested to 600 pounds water pressure, and the shell is subjected to exhaust pressure only.

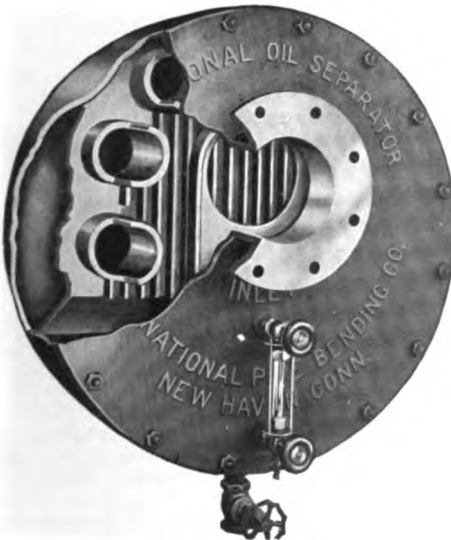
More than 3,250,000 horse power of these heaters have been installed.

Described in Catalog No. 51.



107

THE NATIONAL OIL SEPARATOR



Patent applied for

This gravity-type oil separator absolutely removes all grease or cylinder oil from exhaust steam so that the condensation may be used for feeding boilers, in laundry or dye-house service, ice making, or for similar purposes. It has a multi-ported baffle plate, each port having an individual baffle, a distinctive feature found only in the National Separator. The large capacity of this separator not only insures effective separation of oil from exhaust steam but also overcomes the pulsations of exhaust, giving an even flow of steam.



WARREN WEBSTER & COMPANY

Established 1888 Incorporated 1895

MAIN OFFICE AND WORKS, CAMDEN, NEW JERSEY

BRANCH OFFICES IN THE FOLLOWING CITIES

NEW YORK
PITTSBURGH
INDIANAPOLIS
HOUSTON
LOS ANGELES
SAGINAW
RICHMOND

PHILADELPHIA
ATLANTA
CLEVELAND
NEW ORLEANS
DENVER
DETROIT
MILWAUKEE

CHICAGO
ST. LOUIS
MINNEAPOLIS
SEATTLE
WILKES-BARRE
SALT LAKE CITY
ROCHESTER

BOSTON
CINCINNATI
KANSAS CITY
SAN FRANCISCO
WASHINGTON, D. C.
ATLANTIC CITY
CHARLOTTE

Sole Representatives and Manufacturers for Canada

DARLING BROTHERS, LTD., MONTREAL

St. Johns, Winnipeg, Calgary, Toronto, Vancouver, London, Ont.
THE ATMOSPHERIC STEAM HEATING CO., LTD., LONDON, ENGLAND

WEBSTER SYSTEMS OF STEAM HEATING

Vacuum

Hy-Lo

Modulation

Having been pioneers in Vacuum Heating and before the engineering world for 30 years there are few in the line who do not know the reputation we have established for excellence of materials and service.

The devices which go to make up a Webster Vacuum or Modulation System are varied in construction and operation so as to meet all requirements, and standing back of each Webster Installation as we do, it is but natural that we prefer to co-operate with the Architect, Consulting Engineer, Heating Contractor or Owner in the design and construction of the apparatus. The Webster Appliances are furnished as a complete System. We are at your service with a trained engineering organization, and have made fuel conservation a life-study.

Although the Webster Sylphon Trap is by far the best water and air relief trap on the market, we find many cases where other traps of our manufacture are better adapted to specific cases, so for this reason we would advise those who specify systems of this type to leave the selection of the devices to us, where we are called upon to guarantee results.

The Webster Modulation Valve is made in several types also and can be applied to the supply connection of any kind of radiating surface using steam as a heating medium.

Universal joint—Extended stem valves for radiators beneath seats

or behind grills, chain control for overhead radiators or coils have been perfected to a point of absolute success.

The several types of Webster Modulation Valves are used successfully with or without a vacuum pump according to the nature of the building or buildings in which they are installed, and where applied and operated according to our instructions make it possible to modulate the temperature of a room by measuring the quantity of steam admitted.

The removal of air and water of condensation from radiators, coils or piping is accomplished successfully without steam leakage. The Webster Sylphon Trap, the most efficient device for that purpose, operates at any pressure or vacuum from 15 pounds above to 15 inches below, atmospheric pressure being compensated for pressure.

A perfect balance within this System can be maintained by the application of our Hy-Lo method with which a high vacuum can be carried on trunk lines and lower vacuums on branches, making lifts and difficult situations easy to overcome.

For Convenience, Economy and Efficiency in heating, there is no better method than "The Webster" and with our experienced Service Department Engineers, backed by our ability to make good, the slogan that "The Webster Guarantee is the Owner's Insurance Policy" is a fact and not a theory.

Write for illustrated Catalogue V-34 containing complete information.



Webster Sylphon Trap
No. 522—Interior View



Webster Modulation Valve
Type N—Interior View

WARREN WEBSTER & COMPANY

WEBSTER FEED WATER HEATERS

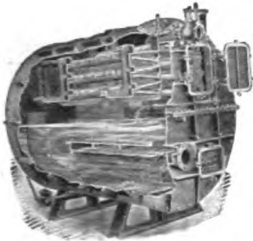
The Webster Chemical Purifier is a Feed Water Heater and Purifier of the Hot Process Type, using simple and cheap chemicals for the thorough purification of hard scale-forming boiler feed waters.

All Webster Feed Water Heaters embody the following special features:

- (a) Heating Trays of perforated sheet metal, light, easy to clean, durable and permitting the most intimate intermixture of steam and water because of the small perforations obtainable by the use of such materials.
- (b) Open Sink Pans (instead of hollow floats)—for automatically controlling water inlets and overflow—positive in action, cannot become inoperative except by abuse.
- (c) Complete segregation of oil separator drips from any connection with other openings into the Heater, thus preventing oil contamination otherwise caused by accident or negligence.
- (d) Vacuum Principle, by which the Heater assists the passage of steam into itself, thereby reducing back pressure upon engines.



Webster Feed Water Heater
Class EC Standard Type
Interior View



Webster Feed Water Heater
Class ED Standard Type
Interior View

Webster Heaters save (1) Fuel (usually from 10 to 17%), (2) Water (usually from 10 to 14%) as compared with the use of a closed type of heater or with no heater whatever, (3) Boiler repairs due to boiler strains, and (4) Boiler cleaning expense due to their action as Water Purifiers.

WEBSTER OPEN FEED WATER HEATERS are built in all types and sizes for any conditions of service, space, head-room, etc. They can be furnished either Standard Type (induction principle with Oil Separator attached to Heater shell) or Preference Type (the most improved form of Cut-Out Heater using a Gate Valve in connection with an

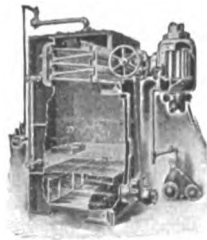
Oil Separator of ample size to purify all steam passing through the exhaust main to both the Feed Water Heater and to a Heating or Drying System or to Low Pressure Turbines).

Class "EB"—300 to 12000 horsepower capacities—vertical rectangular pattern—upward flow filtration

Class "EC"—500 to 7000 horsepower capacities—vertical rectangular pattern—upward flow filtration.

Class "ED"—500 to 15000 horsepower capacities—horizontal cylindrical pattern (particularly adapted for low head-room)—upward flow filtration.

Class "EF"—50 to 350 horsepower capacities—vented rectangular one-piece body type—either upward or downward flow filtration as required.



Webster Feed Water Heater
Class EB Cut-Out Type
Interior View

Illustrated Feed Water Heater Catalogue F-34 mailed upon request.

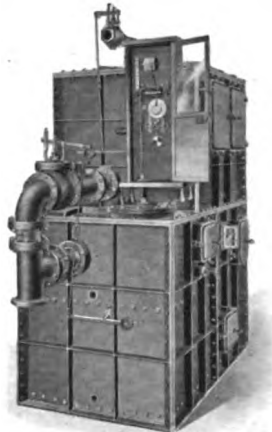
(Continued on next page)

(Continued from preceding pages)

WARREN WEBSTER & COMPANY

WEBSTER-LEA HEATER-METER

A practical combination of a thoroughly efficient Feed Water Heater with an accurate V-Notch Weir Meter so arranged that either unit may be operated with equal efficiency, in combination or independently. Has all the advantages of independent apparatus, as there is no interior connection between the heating chamber and the measuring tank. All floor space and head-room requirements are reduced to a minimum. Division plate between Heater and Meter prevents direct flow of heated water to Meter. Water passes through outside connection which contains a regulating valve operated by a float that is located in the storage chamber for heated and metered water. Flexibility is assured, as either unit may be cut out of service while the other remains in efficient operation. The Patented Extra Storage Type Meter has a large storage chamber for heated and metered water.



Webster-Lea Heater-Meter
Patented and Patents Pending

Absolute meter accuracy results because

1. The Weir cannot be flooded, even if the Heater were to overflow.
 2. Variations in steam pressure in Heater cannot affect water levels in the Meter.
- Made in the following types, of cast iron, wrought iron, steel or special materials:
- (a) For exhaust pressure ranging from atmospheric to one pound.
 - (b) Equipped with cut-out valve and Preference Oil Separator, for use in connection with any type of heating system, under normal back pressures.
 - (c) Made to withstand abnormal back pressures up to twenty pounds per square inch.

Fully covered by patents granted and pending.

Booklet L-34 sent upon request.

WEBSTER STEAM AND OIL SEPARATORS

Webster Steam Separators for the protection and added economy of engines, turbines and pumps, and Webster Receiver Separators giving in addition a means for permitting smaller piping and for equalizing pulsations, are manufactured in types for any direction of flow (horizontal, vertical or angle), of either cast iron or cast steel, and for high or low pressure.



Webster Oil Separator
Interior View

Webster Oil Separators for either pressure, atmospheric or vacuum conditions and Webster Receiver Oil Separators for use with low pressure turbines or other service are made for horizontal, vertical or angular direction of flow and of several types depending upon operating conditions. Exhaust steam which has passed through any type of Webster Oil Separator may, when condensed, be returned to boilers or used for manufacturing purposes with perfect safety.

Send for descriptive Catalogue S-34



Webster Steam Separator

ARTHUR E. KRAUSE

MOUNTAIN LAKES, NEW JERSEY

KRAUSE ABSORBENT FILTERS FOR PURIFYING EMULSIFIED OILY CONDENSATE.

The only Filter completely removing all traces of oil from condenser and pipe returns, rendering water absolutely clear and safe for boiler feed.

Reduces Coal and Water Bills, Dispenses with Compounds, Keeps Boilers Clean, Improves Evaporation and Saves Boiler Repairs.

The universally acknowledged impossibility of removing the last few grains of merely mechanically filtered lubricating oil per gallon from condensate returns without resorting to more or less complicated methods has now been finally and satisfactorily overcome by means of the Krause patented process of Absorbent Filtration.

This process is successfully installed in numerous power plants in New York City and vicinity. The impossibility heretofore of satisfactorily filtering such condensate is owing to the infinitesimally small size of the oil particles therein, which will readily pass through even the finest filter paper—hence the failure of all attempts to remove such fine oil globules by straining the condensate through any of the various kinds of Turkish toweling, burlaps, sand or other granular material will be easily understood.

It may be needless to mention to experienced engineers that where even small amounts of oil, just rendering the condensate slightly opalescent, are returned to the boiler continuously, the total amounts of oil accumulating in the boiler from time to time soon render such feed water dangerous for use by depositing a dangerously non-conducting film of oil within the boiler tubes, plates, or boiler sheets. This is well known according to experience in the past and has frequently resulted in burnt water tubes, bulged or bagged boiler sheets and even serious explosions.

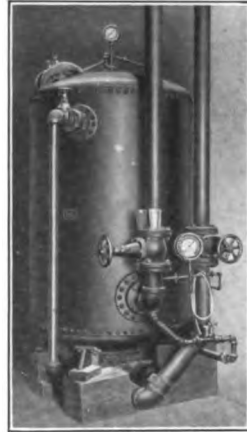
The success of the Krause process of filtration through an insoluble absorbent material in removing the last traces of oil and thereby rendering the condensate pure, clear and safe depends upon the remarkable and energetic physical property of absorbing emulsified oil when brought into contact with it, as in oily condensate, and not upon any mere mechanical straining action.

This absorbent material is insoluble and will last from four to six months before requiring renewal in the filter.

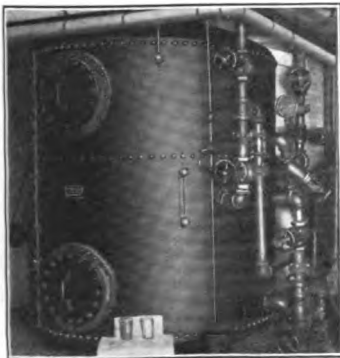
By means of a special skimming device these filters will also draw off completely the coarse or floating oil from the condensate so that such oil may be used over again.

If the purest and softest possible feed water for your boilers is desired no better than that produced from your own return condensate can be obtained nor so simply and economically.

There are no chemicals, mixing tanks or expert attention required.



Krause Absorbent Filter
4 feet in diameter, Consolidated Gas Co., New York



Krause Absorbent Filter
6 feet in diameter, double chamber,
Exchange Court Building, New York

MILWAUKEE RELIANCE BOILER WKS.

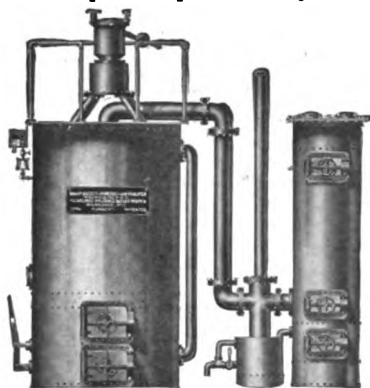
MILWAUKEE, WIS.

Manufacturers of Gas Producers, Feed Water Heaters, Storage Tanks

SHARP-BASSETT IMPROVED GAS PRODUCER

Designed to operate on anthracite coal.
Multiple unit plants in any size

Built in units of 25 to 300 H. P.
Complete power plant installations



Sharp-Bassett Improved Gas Producer

In designing the SHARP-BASSETT IMPROVED GAS PRODUCER, it has been our aim to place a gas producer on the market that is simple, convenient to operate, economical and absolutely reliable under all working conditions.

The producer is entirely self-contained, depending in no way on a separate source for the generating of steam or heating of the in-going air supply. It is complete and ready to be connected to a gas engine or to heat-treating furnaces as may be required.

Our Improved Producer is a gas generator, a steam generator, a heater and a saturator all in one. The heating and the saturating of the air is accomplished by means of utilizing the heat which radiates from the fuel column through

the lining and shell. This greatly increases the efficiency of our Producer which with nearly all other makes of producers is a total loss.

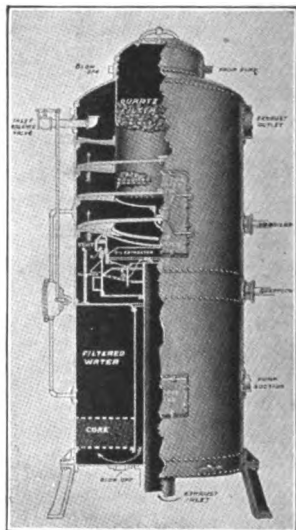
BOILER FEED WATER HEATERS AND PURIFIERS

Our heaters are built throughout in the most substantial and workmanlike manner. They have a large heating surface and are very accessible, making it very simple to get into the interior for cleaning or removing any parts.

The Perfection Boiler Feed Water Heater and Purifier is built in two types. The double filter type shown is a combination open and closed heater with two filters. The single filter type is an open heater with an oil extractor enclosed entirely inside of the heater. This is flushed out every time the heater overflows, and thus kept perfectly clean. The double filter heater has all the same features of the single filter heater with the addition of a boiler pressure filter which is placed in the top of same.

The Reliance Heater and Purifier has an oil extractor placed on the outside of same. This oil extractor has a hollow baffle through which all the water passes before entering the heater.

All heaters manufactured by this company have the under-feed filters; that is, the water passes to the bottom of the heater and then up through the filter-bed.



Perfection Heater and Purifier

The Reliance Closed Heater is made of heavy plate steel. It is constructed with both heads removable so as to make the tube ends easily accessible either for the purpose of cleaning or renewing tubes. Can be made with copper, brass, steel or iron tubes.

SPRAY ENGINEERING COMPANY

93 FEDERAL ST., BOSTON, MASS.

Engineers—Manufacturers

"SPRACO" EQUIPMENT FOR COOLING CONDENSING WATER



Spray Cooling Equipment Installed over Natural Pond

Spray Cooling Ponds equipped with our special "Spraco" Cooling equipment require only from five to seven pounds pressure per square inch at the nozzle. With this pressure, the water is thrown to a height of from five to seven feet above the tip of the nozzle in a uniform, dense, conical spray. A current of air is created in an upward direction around each nozzle due to its driving effect as well as to the heating effect which the spray has on the air in contact with the water, thus rapidly carrying away the warm, moist air produced and replacing it with cool, dry air brought in over the surface of the pond.

We find from our experience in designing over four hundred ponds, now in successful operation in the United States and other countries, that it is impossible to lay down exact rules for the design of these ponds, as local conditions make each case a special problem. Hence, if the amount of water to be cooled, the amount of steam condensed in heating this water, the cooling or vacuum desired, as well as the dimensions of the space available for the installation and whether on ground or roof are given us we will be pleased to send complete specifications and sketch of arrangement, best suited to conditions given.

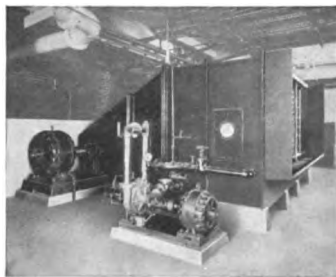
"SPRACO" AIR WASHERS FOR STEAM TURBINE GENERATORS

As the capacity of the electric generator is directly dependent upon its temperature, which in turn depends upon the air conditions, an ample supply of cool, clean air is of great importance. Dust or soot deposited within the machine greatly reduces the efficiency of air as a cooling medium.

As generators usually reach maximum efficiency at or above full load, our "Spraco" Washers produce the double benefit of higher efficiency and greater capacity.

An average gain in capacity of only 5% on a 5,000 kw. machine means an increase of 250 kw. At \$20 per kilowatt per annum this gives \$5,000 increased earning capacity in one year. The increase for four months would about cover the cost of the air washer, which would thus pay for itself quickly, and then provide a very large return on the investment.

The cost of cleaning a large generator is high and, where the air is unwashed, must be undertaken at least twice a year. This can be largely avoided by the use of our "Spraco" Air Washers.



Typical Air Washer Installation



WESTINGHOUSE ELECTRIC & MFG. CO.

EAST PITTSBURGH, PA.

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Bluefield, W. Va.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio

Cleveland, Ohio
Columbus, Ohio
*Dallas, Tex.
Dayton, Ohio
Denver, Colo.
Des Moines, Ia.
Detroit, Mich.
Duluth, Minn.
*El Paso, Tex.
Indianapolis, Ind.
Joplin, Mo.
Kansas City, Mo.

Louisville, Ky.
Los Angeles, Cal.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Rochester, N. Y.
St. Louis, Mo.

Salt Lake City,
Utah
San Francisco,
Cal.
Seattle, Wash.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.
Wilkes-Barre, Pa.
*W. E. & M. Co.
of Texas

ELECTRICAL EQUIPMENT

Generating Equipment
Switchboards
Switchboard Meters
Converters
Heating Devices
Lightning Arresters



Motors (Alternating Current)
Motors (Direct Current)
Arc Lamps
Control Equipment
Transformers
Regulators

Co-operative Service

Westinghouse Electric & Manufacturing Company, manufacturers of apparatus for Generation, Application and Control of electric power, invite the members of the A. S. M. E. to use the facilities of our engineering department in the planning and selecting of electrical equipment.



Westinghouse Type SK direct-current motors are designed for general constant and adjustable speed service, and therefore find extensive application to machines used in practically every industry especially for driving machine tools and for other services where the load is frequently started, stopped, or reversed. The SK motors are of steel construction, with few parts, all of which are readily accessible. The materials used have been selected so as to combine light weight with great mechanical strength.

Westinghouse Type CS alternating-current motors are designed for general constant speed service and are therefore applicable for driving machines in every industry. They are made in all standard sizes from 2 to 650 horsepower, for all commercial voltages and frequencies.



Forged open-hearth steel is largely used in the construction, which not only provides great strength but reduces the weight of the inactive material and all overall dimensions, to a minimum. The rotors are practically indestructible; the bearings have very liberal areas, are non-leaking and are protected from dust.

The efficiency, power factor, and overload capacity are unusually high, since high efficiency means low operating costs. Special attention has been given to this point, not only at full loads, but at fractional loads. As a result of these features, type CS motors can be depended on to operate with maximum economy and to give satisfactory service for years, with little attention.



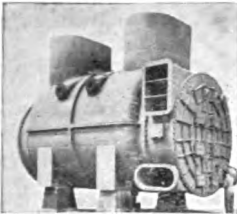
WESTINGHOUSE ELECTRIC & MFG. CO.

POWER EQUIPMENT

Turbo-Generators from one to 100,000 Horse Power
Condensers—Surface, Low Level Jet and Barometric
Stokers—Underfeed, Roney and Chain Grate



Power House Auxiliaries, such as small geared turbo-generators and geared turbines for Pump, Fan and Blower drive



Large Surface Condenser

Because of their exceptional performance, Westinghouse Condensers have become generally known throughout this country and abroad as **HIGH-VACUA** Condensers.

They are installed and operating in many parts of the world—Peru, Russia, Brazil, Porto Rico, Manchuria, Cuba, New Foundland, Japan, Hawaii, New Mexico, British West Indies, Alaska, Siberia and other foreign lands. Only Condensers of **UNDISPUTED RELIABILITY** could have become so widely known and used.

At the present time **Westinghouse Surface Condensers** are being built to serve turbines up to 100,000 Horse Power.

COMPACTNESS is a very important feature of all Westinghouse Condensers. This is especially true of the Jet type referred to later, and of the Unit Type Surface. All pumps are located directly beneath and the pump runners all mounted on one shaft, driven by one turbine or motor as demanded by local conditions.

Jet Condensers are also built in large sizes—the largest to date being a Twin to serve a 45,000 kw. turbine. The twin type is often made use of when large capacity is required, not because the



Unit Type Surface Condenser

limit in size of the single condenser is reached, but because the twin type frequently can be better adapted to the requirements of the installation. It has the additional advantage of greater surety of uninterrupted operation, for, should it become necessary, the full load of the turbine may be carried on one "leg" with good vacua until the necessary inspection of the other half is completed. This is a feature which should not be overlooked by the prospective condenser purchaser.

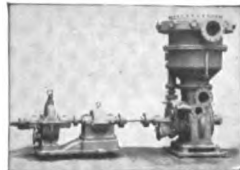
The **Westinghouse Leblanc Air Pump**, used on all our Condensers, has become well known throughout the country on account of its very high efficiency. Being of the centrifugal type and removing the air by "water pistons" or water



Twin Type Jet Condenser

layers, it has the peculiar advantage of increasing in efficiency *at the time* highest efficiency is *most needed*—as the **VACUUM INCREASES**. Hence the efficiency of the Leblanc Pump rises until maximum air scavenging is attained. The absence of reciprocating parts, valves and clearances, enables it to far exceed the reciprocating pump in efficiency and continuity of service.

Westinghouse Condensers are unexcelled in the ability to maintain high vacua, simplicity of construction, reliability and compactness.



Small Low Level Jet Condenser

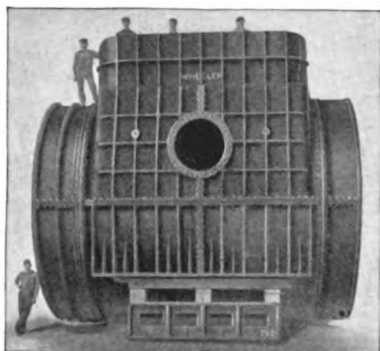
WHEELER CONDENSER AND ENGINEERING CO.

MAIN OFFICE AND WORKS:

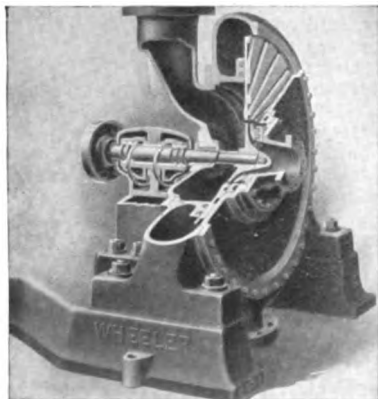
CARTERET, NEW JERSEY

**Manufacturers of Complete Condensing and Evaporating Equipment
Including Tubes**

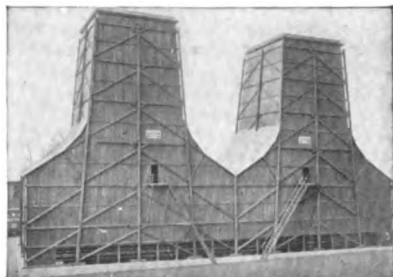
BRANCHES: NEW YORK, BOSTON, PHILADELPHIA, CHICAGO, ST. LOUIS, CINCINNATI,
PITTSBURGH, DENVER, SAN FRANCISCO, CHARLOTTE, NEW ORLEANS, ATLANTA, LONDON,
YOKOHAMA, MELBOURNE, SHANGHAI, HAVANA.



Wheeler High Vacuum Surface Condenser



Wheeler Turbo Air Pump



Wheeler-Balcke Natural Draft Tower of
500,000 Gallons per Hour Capacity

HIGH VACUUM SURFACE CONDENSERS

For turbines of any capacity, condensing equipments operating on wet or dry system, with tube surface of condenser arranged to give best distribution of steam for high efficiency and maximum rate of heat transmission.

HIGH VACUUM JET CONDENSERS

For turbines of any size to maintain vacuum of 28 inches and up. Built on the counter-current "rain type" principle to insure maximum temperature of discharge water, and, therefore, minimum quantity of water, and minimum pumping cost.

WHEELER TURBO AIR PUMPS

High Speed Rotary type for jet or surface condensers. Direct connected to turbine or motor. Combined with condensate pump in one casing or independent type.

WHEELER-EDWARDS AIR PUMPS FOR AIR AND CONDENSATE

Eliminate expense of independent air and hot well pumps. No suction or bucket valves.

WHEELER ROTATIVE DRY VACUUM PUMP

Will maintain a vacuum within 0.5" of barometer. For high vacuum jet condensers and large surface condensing equipments. Clearance effect reduced by an equalizing port.

CENTRIFUGAL PUMPS FOR ALL SERVICES

Circulating tail water and hot well pumps for condensers and high efficiency single stage pumps for all purposes. Pumps of all sizes driven by motor, steam turbine or engine for water works, irrigation, etc.

FORCED DRAFT STEEL TOWERS

Recommended for efficient cooling of water where ground space is limited, and smallest size tower must be used.

NATURAL DRAFT WOODEN TOWERS

For manufacturing and industrial plants, also central stations where a supply of cooling water is not available. Operating cost consists of water pumping cost only. Designed for special low lift so as to reduce this cost to the minimum.

BRASS AND COPPER TUBES

All standard sizes and gauges manufactured in large Wheeler mill particularly for condensers and evaporators.

EVAPORATORS

Lillie vapor and liquor reversing, or standard types.

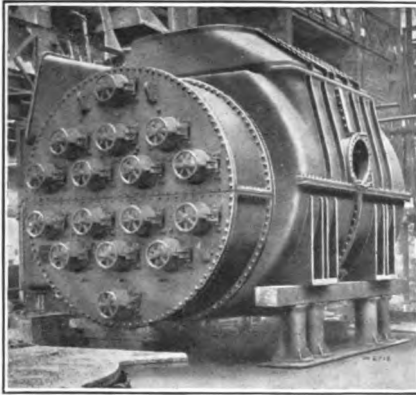
WORTHINGTON PUMP AND MACHINERY CORPORATION

115 BROADWAY, NEW YORK

WORKS, HARRISON, N. J.

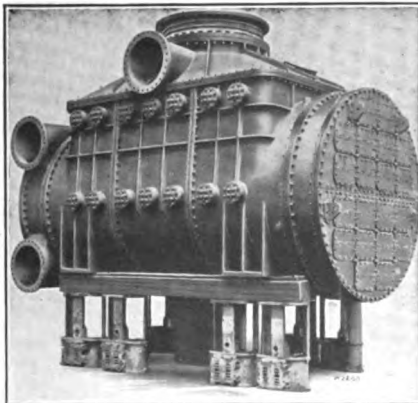
Manufacturers of Surface, Barometric and Centrifugal Jet Condensing Systems, Complete with Auxiliaries; Cooling Towers; Duplex Direct-Acting, Centrifugal, Turbine and Multi-State Pumps for Every Service, Boiler Feed, Elevator, Fire, Pressure Pumps; Water Meters; Water Works, Sewage and Drainage Pumping Engines

WORTHINGTON SURFACE CONDENSERS



117

Containing 35,000 ft. surface and having special quick-opening handhole plates on water boxes; installed by the New York Central R. R. Co. at their Port Morris Station.



This surface condenser, containing 20,000 ft. surface, is installed for the Municipal Council of Shanghai, China, in connection with a 10,000 kw. General Electric steam turbine.

Attention is called to the special construction showing provision for unusually high test pressure on the condenser shell.

W 366.8

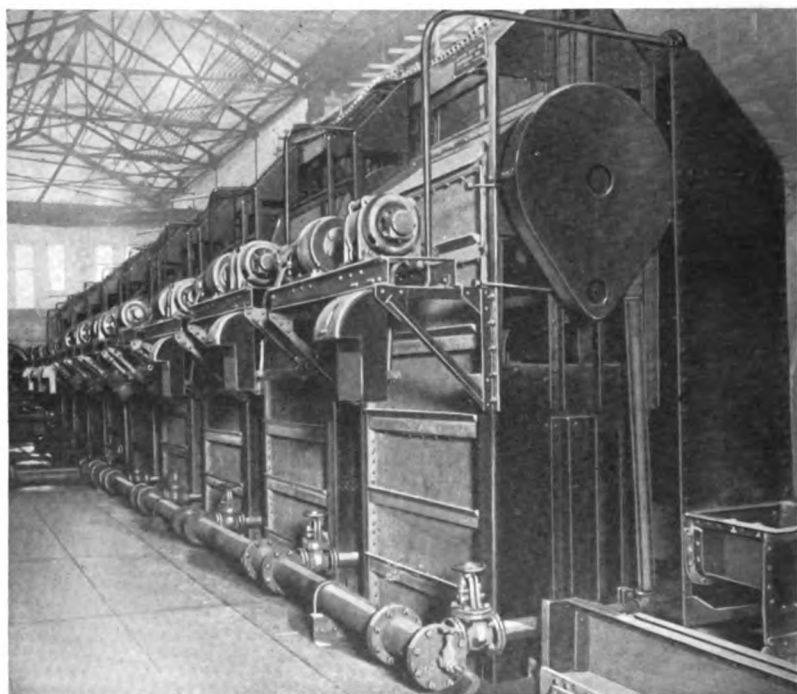
CHAIN BELT COMPANY

Established 1891

735 PARK ST., MILWAUKEE, WIS.

Pioneer Manufacturers of Traveling Water Screens

REX TRAVELING WATER SCREENS



118

Many steam power and industrial plants are standardizing on REX TRAVELING WATER SCREENS as the most modern equipment designed to furnish clean intake water—and intake water must be free from all debris for condensers to work right.

The illustration above shows a large steel plant battery of REX TRAVELING WATER SCREENS. They insure clean intake water and better condensation.

By their operation a material saving in coal is effected and hand cleaning of screen surfaces is eliminated.

Write for catalogs, lists of users and preliminary estimates.

Our engineers are at your service.

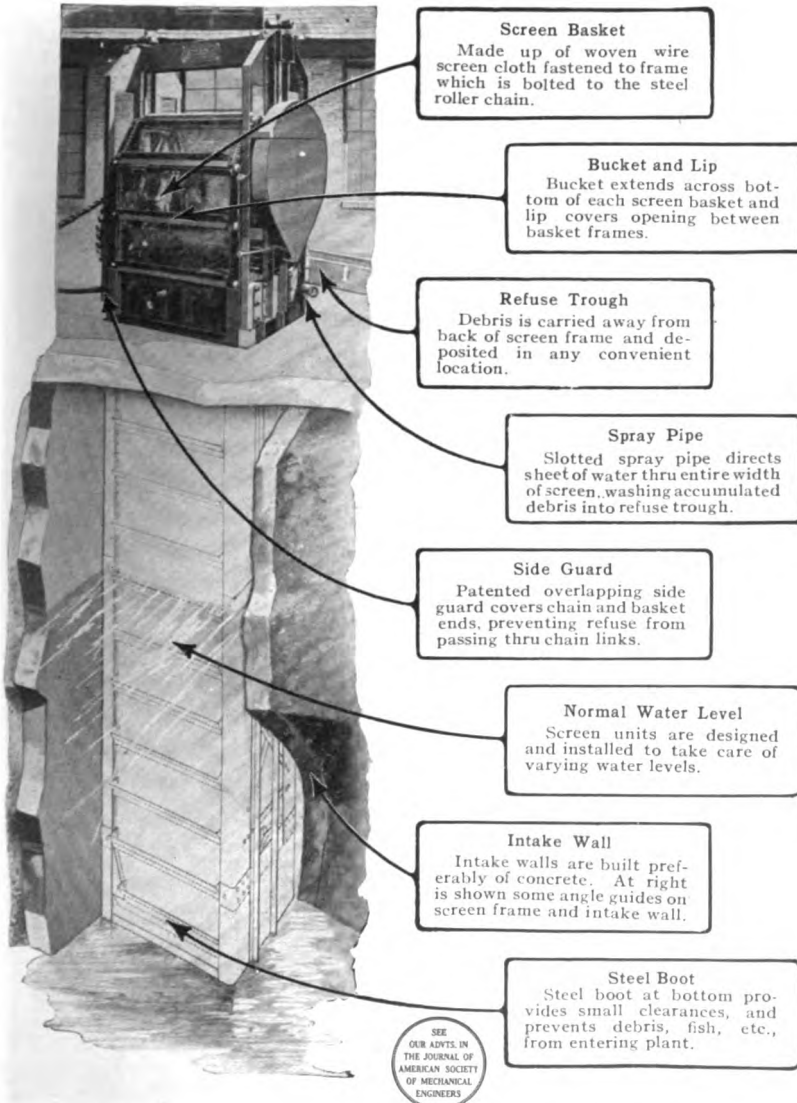
CHAIN BELT COMPANY

Established 1891

735 PARK STREET, MILWAUKEE, WIS.

Manufacturers of Rex Chain, Rex Traveling Water Screens, Rex Concrete Mixers, Rex Sprockets, Rex Elevators and Conveyors

REX TRAVELING WATER SCREENS



CRANE CO.

Founded by R. T. Crane 1885

836 So. MICHIGAN AVE., CHICAGO, ILL.

Cable address, Cranecoy, Chicago

Branches in Fifty-three Cities

Cast Steel Valves and Fittings; Cranetilt Steam and Vacuum Traps; Valves, Cocks and Fittings in Brass, Malleable Iron and Cast Iron; Steam Specialties; Complete Piping Equipment; Pipe Bends; Pipe Fitters' Tools; Engineers' Supplies, Etc.

CRANE CAST STEEL VALVES AND FITTINGS

We have been manufacturing for some time a line of steel fittings to meet a steadily growing demand for a superior grade of goods, especially adapted for High Pressure, Saturated and Superheated Steam Lines and Extreme Hydraulic Service. These are suitable for steam working pressures up to 400 pounds, and for superheat up to a total temperature of 800 degrees F. We are prepared to supply Pop Safety, Gate, Blow-Off Valves, and all other material to comply with the A. S. M. E. Boiler Code.



No. 9A
Rising Stem Gate
Valve with By-Pass



No. 28A
Stop Check Valve



No. 23A
Angle Valve



No. 101D Elbow



No. 105D Tee
Extra Heavy
Cast Steel Flanged
Fittings.

GENERAL SPECIFICATIONS

For Steel Valves

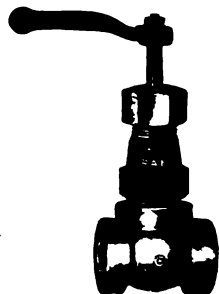
CAST STEEL Body, Bonnet, Disc and Yoke

MONEL METAL Seats

ROLLED MONEL METAL or STEEL Stems

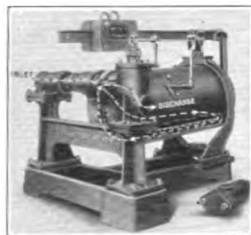
CRANE FORGED STEEL VALVES AND FITTINGS

are suitable for pressures up to 10,000 lbs. depending on the article and size.

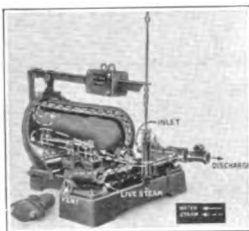


We carry a large stock of cast steel valves and fittings.

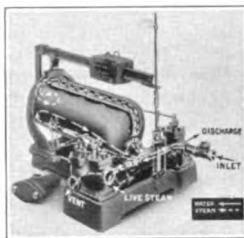
CRANE CO.



NON-RETURN TRAP
Made in sizes $\frac{1}{4}$ to 3 inch;
capacities up to 112,500
pounds of water an hour.



DIRECT RETURN TRAP
Made in sizes $\frac{1}{4}$ to 4 inch;
capacities up to 28,000
pounds of water an hour.



LIFTING AND VACUUM TRAP
made in sizes $\frac{1}{4}$ to 4 inch;
capacities up to 28,000
pounds of water an hour.

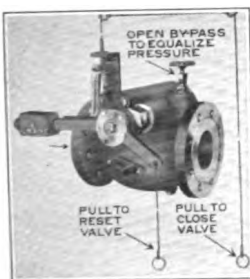


**ELECTRICALLY
OPERATED VALVE**

CRANE CO.
was awarded the
GRAND PRIZE
the
HIGHEST AWARD MADE
on Equipment for the Transmission and
Control of Steam, Water and Gas,
by the
International Jury of Awards of the
Panama-Pacific International Exposition,
at San Francisco, 1915.



**CYLINDER
OPERATED
VALVE**

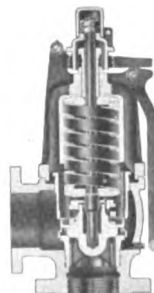


**EMERGENCY ENGINE
STOP VALVE**

The frequency of accidents which require the shutting off of steam instantly has led several states to require by law a quick-closing Engine Stop Valve on the steam lead to each engine.



PRESSURE REGULATOR
For steam and air.



**OUTSIDE SPRING AND
YOKE POP SAFETY VALVE**

Conform to all requirements for stationary and marine boilers, A. S. M. E. Boiler Code and the United States Board of Supervising Inspectors of steam vessels.



(Continued on next pages)

(Continued from preceding pages)

CRANE CO.

CHICAGO, ILL.

SUMMARY OF CRANE PRODUCTS

We give on this and the following page a description of our line. We carry in stock at our branch houses a large supply of the goods listed below and are prepared to furnish without delay Special Valves, Fittings, etc., to meet specific requirements or conditions.

The term Standard is applied to products intended for steam working pressures not exceeding 125 pounds. The Low Pressure Fittings, etc., may be used for Steam Working Pressures up to 25 pounds, while the Medium Goods are intended for 175 to 225 pounds. The Extra Heavy are designed for Steam Working Pressures up to 250 pounds.

The proportionate Water-Working Pressure may be taken as follows: Low Pressure, Standard and Medium, 40 per cent greater than the steam pressure on sizes 12 inch and smaller; sizes 14 inch and larger, 20 per cent greater.

STANDARD GOODS

We manufacture brass Globe, Angle and Cross Valves, screwed, in sizes from $\frac{1}{8}$ to 4 inches; and the flanged pattern from $\frac{3}{4}$ to 4 inches. The brass Check Valves are made in many patterns, the sizes of which run from $\frac{1}{8}$ to 3 inches. The brass line also includes: Hose, Garden Hose, Coke Oven, Needle Point, Straight-Way and Hose Gate. Our lines of Radiator Valves and Fittings, brass Steam and Gas Cocks are complete. The Cast Iron material includes Cocks of various patterns; Globe, Angle and Cross Valves with yoke patterns; the sizes ranging from 2 to 16 inches. We make Brass and Cast Iron Pipe Fittings in both the screwed and flanged patterns as well as Malleable Pipe Fittings screwed. With the Standard Goods are also included iron Gate Valves, Expansion Joints with iron body and brass sleeve, Railing Fittings, Drainage Fittings, Steam Fitters' and Engineers' Tools, Pipe Bends, and Pipe Supports, Brackets, etc.

LOW PRESSURE GOODS

The regular low pressure Gate Valves are made in several patterns and in sizes up to 72 inches. The low pressure Pipe Fittings are of the flanged pattern and include Elbows, 45 degree Elbows, Tees, Reducing Tees, Crosses, Reducing Crosses, Long Radius Elbows, Base Elbows and Tees with square and round base and Taper Reducers.

MEDIUM PRESSURE GOODS

This line includes the Crane Navy Globe, Angle, Cross and Check Valves made of Crane Special Brass, the screwed pattern being made in sizes ranging from $\frac{1}{4}$ to 4 inches and the flanged pattern from $\frac{3}{4}$ to 4 inches. The brass Gate Valves come with non-rising stems, either screwed or flanged, while the rising stem pattern has a yoke and is screwed. We also make in the medium class, Globe, Angle and Cross Valves with Ferrosteel body, flanged in sizes ranging from 2 to 12 inches; the Gate Ferrosteel Valves are made in sizes 2 to 24 inches.

CRANE CO.

EXTRA HEAVY GOODS

Under this heading will be found Valves and Fittings for Steam working pressures up to 400 pounds and for superheat up to a total temperature of 800° F., depending on the article and size. The Extra Heavy line includes Gate, Globe, Angle, Cross, Swing Check, Automatic Stop Check Valves, Expansion Joints with regular and special traverse, and with or without anchor base, Flanged Fittings, various styles of Companion Flanges, etc., made in Ferrosteel and Cast Steel; Crane Special Brass, Gate, Globe, Angle, Cross and Check Valves; Cast Iron, Malleable, Brass and Forged Steel Screwed Fittings and Screwed and Flanged Unions.

HYDRAULIC GOODS

The complete line includes material for various water-working pressures up to 10,000 pounds, depending upon the article and size. It includes Ferrosteel Gate Valves with Non-Rising Stem, and Rising Stem and with or without by-pass, Swing Check Valves, Flanged Fittings and Companion Flanges, sizes ranging from 1½ to 12 inches; Crane Hard Metal Gate, Globe, Angle and Check Valves in sizes ¾ to 2½ inches; Cast Steel Gate and Check Valves, Flanged Fittings and Companion Flanges and Forged Steel Valves, Fittings and Unions; Malleable Iron, Brass and Forged Steel Screwed Fittings.

123

PIPE

We can supply promptly Wrought Pipe—either black or galvanized—Seamless Drawn Brass and Copper Tubing in iron pipe sizes, Standard Weight Spiral Riveted Pressure Pipe, Straight Steam Steel Riveted Pipe. We are prepared to furnish complete piping equipment, bends, etc., ready for erection.

SPECIALTIES AND TRIMMINGS

These are Pop Safety Valves, Automatic Exhaust Relief Valves, Stop Check Valves, Emergency Engine Stop Valves; Chicago Railroad and Navy Unions; Boiler Fittings, Crane Cement for making tight pipe joints, Steam Whistles, Water Gauges, Cocks, Pressure and Vacuum Gauges, Fusible Plugs, Back Pressure Valves, Blow-off Valves, Blow-off Crosses, Pressure Regulators, Float Valves, Exhaust Heads, Flexible Joints, Cranite Packing, Pipe Machines, Steam and Oil Separators, Crane Vacuum Oil Separators, Machine Bolts.

POCKET CATALOGUE

The No. 50 Crane catalogue lists our complete line in compact form. It will be sent upon request.



THE DARLING PUMP & MFG. CO., Ltd.

WILLIAMSPORT, PA.

SALES OFFICES:

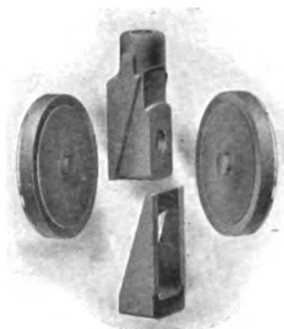
NEW YORK CITY
149 Broadway

CHICAGO
The Rookery

PHILADELPHIA
Commercial Trust Bldg.

**Manufacturers of Darling Gate Valves, Ball Check Valves, Fire Hydrants,
Floor Stands, Indicator Posts, Valve Boxes**

DARLING GATE VALVES



Wedges and Discs Shown Separated

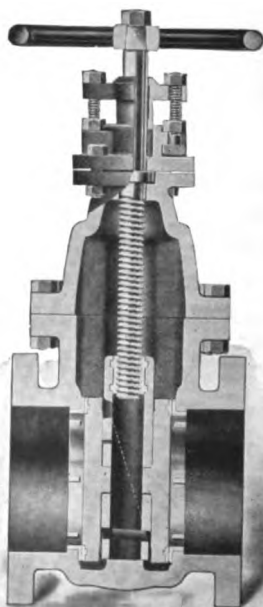
The Darling Patented Gate Valve differs from all others in that it has Parallel Seats, Double Revolving Gate Discs and Compound Equalizing Wedges. The Wedging Mechanism operates between the Gate Discs and independent of them.

The Gate Discs being plain, no portion of the Wedging Mechanism is formed upon them. These Gate Discs revolve independently of the wedges, and independently of each other. The Revolving Gate Discs change their positions on the Seats each time the Valve is closed, thus distributing wear equally over entire faces of Gates and Seats, ensuring durability.

Gates released before opening, avoiding wear on Seats. Cannot stick or bind.

Simple, reliable, durable.

Darling Valves will remain tight longer than any others. They are made for all pressures and purposes.



Sectional View of Inside Screw Valve with Flanged Ends

THE THOMAS P. FORD COMPANY

407 BROOME ST., NEW YORK, N. Y.

Manufacturers of The "Ford" Steam and Water Specialties

THE "FORD" AUTOMATIC RETURN CHECK AND STOP VALVE

(Pat. 1916)

is a genuine improvement in non-return valves, the construction positively removing the objections encountered in the earlier types, sticking and chattering.

Sticking is caused by unequal expansion in the dash-pot. The "FORD" Valve has no dash-pot.

Chattering is caused usually by a dash-pot made of too free and loose a fit, in order to minimize sticking.

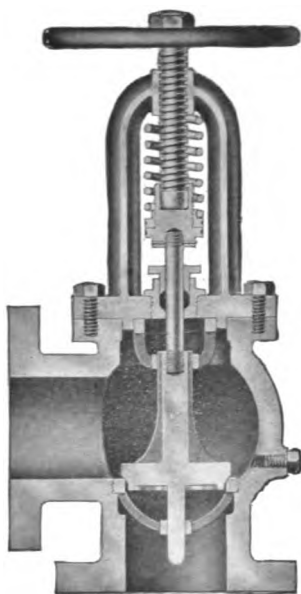
The "FORD" Valve employs an entirely different principle, which not only tries to avoid chattering, but which *does* avoid chattering.

As the "Ford" Valve is without dash-pot, we went about the prevention of Chattering from a different angle. Most valves are balanced, causing an equilibrium at a certain opening of piston. The "Ford" Valve is unbalanced and therefore does not possess the tendency to chatter. Furthermore, we figured the value of an apron or piston choke-off, "A," so that by the time steam is flowing from boiler into main in any appreciable quantity, the valve disc itself is far enough from its seat to make wire-drawing an impossibility.

It is adjustable for sensitiveness to checking, a feature contained in no other valve.

Superheated steam: "Ford" construction produces the ideal valve for super-heat work. Contains *not a single snug fit* to stick under extreme temperatures.

Triple Duty Valves a trifle more intricate, of course, but a marvel of simplicity for the complex service involved.



125



**Pump Regulating
Valve**

Send for blue prints of
THE VALVES THAT CANNOT STICK

**Pump Regulating Valves
High Pressure Tank Float Valves
Steam and Water Reducing Valves, Etc.**

—Complete the "FORD" Line—

(Catalog on request)

**Distributors for
Middle West**

Dickerson & Bolton,
1535 Lytton Bldg.,
Chicago, Ill.



TRADE MARK

HOMESTEAD VALVE MFG. CO.

P. O. BOX 1754, PITTSBURGH, PA.

Manufacturers of Homestead Valves and Other Specialties

HOMESTEAD (Quarter Turn) PLUG VALVES OR COCKS



The first illustration shows our Homestead Straightway Valve, with flanged connections. This pattern is used extensively as a boiler blow-off valve.

Homestead Valves are equally serviceable on all kinds of exacting or high pressure work.

The three-way and four-way valves as shown on the second and third illustrations are used as operating valves on air, water, steam and for many other purposes.

Homestead Valves are so constructed that they open and close with a quarter turn, operate easily and are free from leakage through the valve, the stuffing box or body.

HOVALCO (Blow-Off) VALVE

The valve here shown is a new pattern angle blow-off valve, Semi-steel body, and special composition seat. The disc and seat are reversible, renewable and can be reground. Note the accessibility and the ease with which the parts of this valve can be renewed.

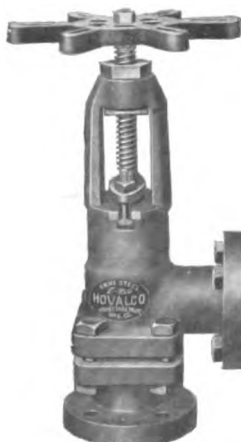


Figure at left shows the "Homestead" and "Hovalco" valve combined. For boiler blow-off purposes, no better arrangement can be secured. The advantages of the double blow-off arrangement are many, the "Hovalco Valve" can be repaired or renewed at any time without closing down the boiler. This is done by closing the "Homestead Cock," while the repairs are being made. The best power plants being built are specifying this arrangement of blow-off valves.

In accordance with the A. S. M. E. Boiler Code.



Section of Hovalco Valve

Catalogue of our complete line sent upon request.



J. E. LONERGAN CO.

211-215 RACE ST., PHILADELPHIA, PA.

Manufacturers of Boiler, Steam and Gas Engine Specialties



Model "B"



POP SAFETY VALVES

Were first made under Lynde Patents issued in the year 1872, and have since been improved upon by our corps of capable engineers of long experience who with their combined skill have brought the LONERGAN POP SAFETY VALVE up to its present state of excellence.



Model "D"

Points of superiority:

1. Does perfect work while in service.
2. Repairs practically nothing.
3. Has long life.
4. Always seats perfectly.
5. *Great relieving capacity* as it is the only valve on the market having an expansion chamber above the seat, with baffle plate over that, so as to get the benefit, as the steam lifts the valve off its seat, of both the compressed and

expanded steam, which construction gives the valve a high lift.

6. *Adjustable screw ring*, very easy to regulate—used to govern number of pounds steam relieved before valve closes.

7. Springs of the best grade PENNSYLVANIA ANALYSIS OPEN HEARTH STEEL, of a fibre stress suited for best results.

8. All valves made with bevel seats, except when otherwise ordered.

127

"Protected Spring" Pop Safety Valve Model "B"

For Water Tube Boilers, etc.
Encased Spring, to protect it from contact with live steam.

LonerGAN Patent Double Eccentric Lifting gear, the best lifting device made.

Good for working pressure up to 300 lbs. Testing yokes furnished at small extra charge.

Fitted for LOCK to prevent their being tampered with.

Recommended for use in Power Stations, Electric Light Plants, Large Manufacturing Plants.

Sizes 2", 2½", 3", 3½", 4", 4½", 5" and 6". Iron Body Bronze Mounted, with either bronze or nickel seats.

DUPLIX POP SAFETY VALVE (MODEL "F"): Two valves in one base casting. Furnished with outlet at either end, or in center. Made in Bronze, Steel, Semi-Steel and Iron. Equipped with Rockershaft Lifting Gear so valves can be lifted in succession or simultaneously. Used largely by U. S. Government, Merchant Marine, etc.

WATER RELIEF VALVES: Good for working pressures up to 300 lbs. Recommended for use on Pumps, Hydraulic Elevators, Pipe Lines, Water Works, etc. Relieving capacity unequaled by any other make of valve on the market.

CHIME WHISTLES: Made in two types, MODEL "WV," Adjustable Lever with Valve, MODEL "WN," without valve. Bell diameter sizes from 1½" to 12". Bells of solid cast bronze and not built up with a web inside of a lap-welded tube. Recommended for Marine and Stationary Work, Fire Alarms, etc.

We also manufacture Cylinder Relief Valves, Plain Whistles, Quick Closing Water Gauges, Automatic Closing Water Gauges, Chain Pull Gauge Cocks, Oil Cups, Grease Cups, Jelco G. G. Cutters.

"Marine" Pop Safety Valve Model "D"

For use on Marine Boilers.

General Specifications same as Model "B."

Handle on top allows valve to be turned on its seat when under steam pressure.

Repairs easily made as valve can be broken below outlet, for seat repairs.

Complies with rules of:

United States Board of Supervising Inspectors of Steam Vessels.

Board of Trade, Great Britain.

British Lloyds.

Bureau of Veritas, France.

Sizes 2", 2½", 3", 3½", 4", 4½", 5" and 6". Iron Body Bronze Mounted.

JENKINS BROS.

80 WHITE ST., NEW YORK

133 NO. SEVENTH ST., PHILADELPHIA

JENKINS BROS., LIMITED

103 St. Remi St., MONTREAL

95 Queen Victoria St., LONDON, E. C.
JENKINS RUBBER CO., ELIZABETH, N. J.

524 ATLANTIC AVE., BOSTON

300 W. LAKE ST., CHICAGO

Manufacturers of Valves in Brass, Iron and Cast Steel; Sheet Packing, Gaskets, Discs, Pump Valves and other Mechanical Rubber Goods



Fig. 106
Brass Globe Valve
Standard Pattern



Fig. 352
Brass Swing
Check Valve



Fig. 370
Brass Gate Valve
Standard Pattern



Fig. 142
Iron Body Globe
Valve, Standard
Pattern

JENKINS BRASS VALVES

Jenkins Brass Globe, Angle and Cross Valves, Standard Pattern, with Jenkins Renewable Discs, suitable for working steam pressures up to 150 pounds, or 250 pounds water. Regularly made in sizes $\frac{1}{4}$ to 3 inches, screwed or flanged. Larger sizes in brass made from iron body patterns.

Jenkins Hose End Globe and Angle Valves, with Jenkins Discs of flexible rubber composition insuring tightness under cold water pressures up to 250 pounds. Sizes $\frac{1}{4}$ to 3 inches, with or without cap and chain, in any style of finish required.

Jenkins Brass Horizontal Angle, and Vertical Check Valves, correspond to same standard as the Standard Pattern Globe and Angle Valves. Regularly furnished with Jenkins Discs of semi-hard composition which will soften slightly under the action of hot water. When specified for cold water, air or gas, a soft, flexible rubber disc is supplied, suitable for 150 pounds working pressure. Sizes $\frac{1}{4}$ to 3 inches, screwed or flanged.

Jenkins Brass Swing Check Valves are made with globe-shaped bodies. Adapted for either horizontal or vertical installation. Furnished with Jenkins Disc, suitable for 150 pounds pressure. Sizes $\frac{1}{4}$ to 3 inches, screwed or flanged.

Jenkins Brass "Y" Valves, besides their extensive use for blow-off service, are particularly desirable for handling muddy and gritty water, and thick, heavy fluids. Sizes $\frac{1}{4}$ to 3 inches, screwed or flanged.

Jenkins Brass Gate Valves, Standard Pattern, especially desirable for plumbing or other service under working pressures 125 pounds steam or 175 pounds water. Made both inside screw and outside screw and yoke. Regularly have rough body, finished trimmings; but polished, nickel plated, wood wheel, brass wheel, or other special finish furnished when so ordered. Sizes $\frac{1}{4}$ to 3 inches, screwed or flanged.

Jenkins Brass Gate Valves, *Medium Pressure*, are especially designed for steam, or hot and cold water lines where high grade installation is required but pressure carried does not warrant use of the more expensive extra heavy pattern. They are guaranteed for 175 pounds steam, 250 pounds water. Sizes $\frac{1}{4}$ to 3 inches.

JENKINS IRON BODY VALVES

Jenkins Iron Body Valves, Standard Pattern, are heavier and considerably stronger than the average iron body valves. Have Jenkins Discs and renewable seat rings. Suitable for working pressures 150 pounds steam or 250 pounds water. Globe and angle valves, sizes 2 to 24 inches inclusive; cross valves up to 8 inches; horizontal, angle and vertical check valves 2 to 8 inches; all iron valves from $\frac{1}{2}$ inch up; safety and back pressure valves in various patterns and sizes; standard pattern gate valves, with solid double-faced wedges, 2 to 30 inches; medium pressure, 2 to 18 inches, with or without by-pass. Flanges, A. S. M. E. standard dimensions.



Fig. 114
Brass Hose
Angle Valve



Fig. 124
Brass Y Valve
Standard Pattern



Fig. 270
Brass Gate Valve
Medium Pressure



Fig. 325
Iron Body Gate
Valve, Standard
Pattern

JENKINS BROS.

JENKINS VALVES FOR HIGH PRESSURE

Jenkins Extra Heavy Brass Valves, Globe, Angle, Cross, Check and other patterns, are suitable for working steam pressures up to and including 300 pounds, or for water and air pressures up to 500 pounds. Carefully designed, well proportioned, handsomely finished, with the most approved features of construction. Sizes $\frac{1}{4}$ to 3 inches.

Jenkins Extra Heavy Iron Body Valves are suitable for working pressures of 250 pounds steam or 400 pounds water. Globe, angle and cross valves made in sizes 2 to 12 inches; valves from 5 inches up can be supplied with by-passes which are cast integral with the body. Horizontal and angle check valves, 2 to 6 inches; swing check valves, 2 to 8 inches; Y valves, 2 to 3 inches; automatic equalizing stop and check valves, 4 to 8 inches. Gate valves with inside screw or outside screw and yoke, in sizes $1\frac{1}{2}$ to 24 inches. Valves can be furnished with by-passes, and their use is particularly recommended on sizes 8 inches and larger. All flanges, A. S. M. E. Extra Heavy Dimensions.

JENKINS CAST STEEL VALVES

Jenkins Cast Steel Valves are made in globe, angle, gate and check patterns, which experience has shown are perfectly adapted for the severe conditions incident to high pressure superheated steam service. The valves are suitable for working steam pressures up to 350 pounds, and total temperature of 800 degrees F. Furnished in practically the same sizes as the Extra Heavy Iron Body Valves.

MECHANICAL RUBBER GOODS

In this line we are offering engineering requisites which are the result of over 50 years of progressive effort. We are the original manufacturers of rubber composition discs for valves and unvulcanized sheet packing.

Jenkins '96 is the name of our high grade unvulcanized or self-vulcanizing packing, furnished in sheets or gaskets, and unsurpassed for all kinds of saturated steam joints. JENARCO is a vulcanized red sheeting. It is very tough and pliable, equally suitable for steam, hot or cold water, and other joints.

Jenkins Pump Valves are made from various compounds. There are pump valves of hard composition, particularly adapted for hot water, as with boiler feed pumps; for oils, acids, and other destructive fluids; semi-hard valves for high pressure cold water service as in mines and elevators, medium soft for cold water, very soft and flexible for low pressure cold water and air. When ordering, state the kind of service in which the valves are to be used, the fluid handled, pressure or head pump is working against, and in all cases give diameter, thickness and size of hole.

All genuine Jenkins Valves bear Diamond Trade Mark, and are absolutely guaranteed to be perfect in workmanship and suitable and efficient in the service for which they are designed.



Fig. 128
Brass Globe
Valve, Extra
Heavy Pattern



Fig. 293
Automatic
Equalizing Stop
and Check
Valve



Fig. 204
Iron Body Gate
Valve, Extra
Heavy Pattern]
Outside Screw
and Yoke



Fig. 227
Pump Valve



Fig. 164c
Iron Body Angle
Valve with By-Pass,
Extra Heavy Pattern

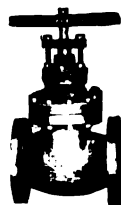


Fig. 203
Iron Body Gate
Valve, Inside Screw,
Extra Heavy Pattern



Fig. 204b
Iron Body Gate
Valve, with By-Pass,
Extra Heavy Pattern



129

A catalogue of all the Jenkins products, giving sizes, styles and list prices, mailed on request.

THE KELLY & JONES CO.

GREENSBURG, PA.

Manufacturers of Cast Iron, Malleable, Brass and Steel Fittings; Brass, Iron Body and Steel Valves, Cocks, Etc., for Steam, Gas, Water, Air and Oil



Cast Iron Fitting

CAST IRON, MALLEABLE AND BRASS FITTINGS

We make every conceivable style and size of screwed cast iron, malleable, brass and steel fittings and for all pressures.

All of our screwed fittings are recessed to permit of the easy entrance of the pipe and threads are cut true to gauge. Will not leak and each fitting a perfect product.



Malleable Fitting



Flanged Fitting

FLANGED FITTINGS

We make a flanged fitting for every pressure and purpose, brass, iron or steel, and in all sizes, straight or reducing.

Dimensions and drilling in accordance with the latest established standards.

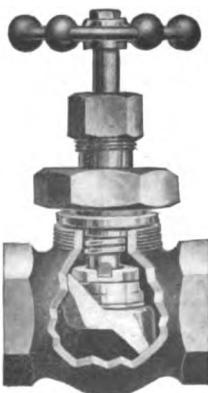


Reducing Flanged Fitting

JENKINS TYPE KELLY & JONES BRASS VALVES

Practical—durable—efficient—economical. Will not leak and can be repacked under full pressure. These K-J Jenkins type brass valves are made of the highest grade steam metal, carefully machined, and are very attractive in appearance. Special pattern for 100 lbs., standard for 125 lbs.

Furnished in globe, angle, cross and check, screwed or flanged, and in all sizes.



"Excelsior"
High Pressure Brass Valve

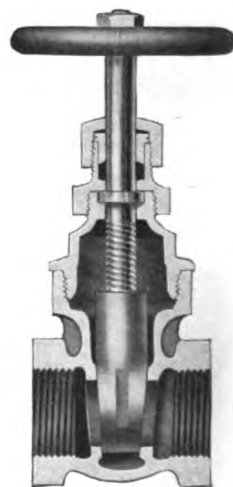
"EXCELSIOR" HIGH PRESSURE BRASS VALVES

For high pressure service, 200 or 300 lbs. of live or superheated steam. Used extensively in modern steam plant construction and in the U. S. Navy. Can be furnished with or without yoke, screwed or flanged, globe, angle, cross and check. Sizes from $\frac{1}{8}$ " to 4".

BRASS GATE VALVES

The Kelly & Jones line of brass gate valves is most complete. Correctly designed and well proportioned and can be furnished screwed or flanged for the following pressures: 100 lbs., 125, 150, 175, 200, 250 and 1000 lbs. Made with outside screw and yoke if desired for 125 or 250 lbs. pressure.

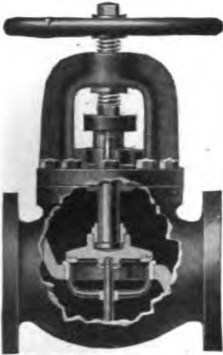
In addition to the solid wedge type illustrated we make brass gate valves with the double disc, either parallel or taper seats.



Brass Gate Valve

THE KELLY & JONES CO.

Send for Catalog "O" illustrating and describing our complete line of valves and fittings.
Our NEW STEEL FOUNDRY is fully equipped for making in "high quality" steel, any of the valves or fittings shown in our general catalog.



Iron Body Globe Valve

IRON BODY VALVES

All styles and sizes for all pressures and purposes including globe, angle, cross, check and safety valves. Screwed or flanged, inside screw or O. S. & Y.

K. & J. blow-off valves, globe or angle, screwed or flanged, perform their function correctly and positively, and thereby prolong the life of the boiler. Built on scientific principles and have been in satisfactory use for years.



Globe Blow-Off Valve



"Saddle" Gate Valve

"SADDLE" GATE VALVES

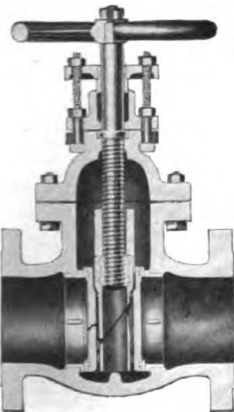
All Iron or Iron Body Brass Mounted

This saddle style is a very durable and compact valve, and economical, owing to the simplicity of construction. The steel saddle around the body of the valve holds the bonnet securely in place, and can easily be removed, permitting of access to the interior of the valve for cleaning or repair purposes. Opens to the left and has a rising spindle.

The solid disc in this valve is very narrow and V-shaped at the bottom, and can, therefore, be seated more readily when dirt and sediment are collected between the seats in the valve. Screwed or flanged, sizes $\frac{1}{2}$ " to 6".



Iron Body Gate Valve Solid Wedge



Iron Body Gate Valve Double Disc

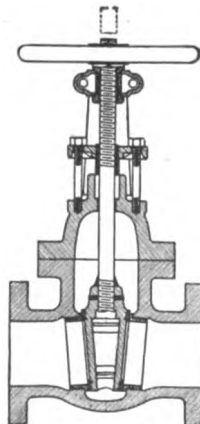
IRON BODY GATE VALVES

Solid Wedge or Double Disc

Our iron body gate valves can be furnished screwed or flanged, with or without yoke and by-pass and for 25, 125, 175, 250 and 1000 lbs. pressure.

These valves are also made all iron for temperatures exceeding 325° Fahrenheit and for handling cyanides, acids and other solutions injurious to brass.

We also make these gate valves with the double disc, parallel or taper seats.



PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

PITTSBURGH, PA.

Engineers, Manufacturers and Erectors
Exclusive Manufacturers of Gulland Automatic Standpipes

BRANCH OFFICES AND AGENTS

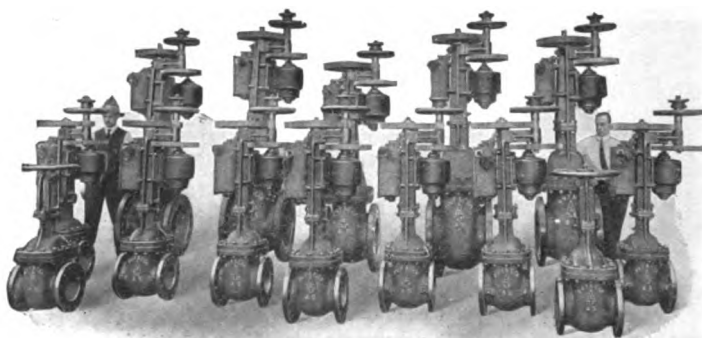
NEW YORK OFFICE, 30 Church St.
CLEVELAND OFFICE, 1308 Rockefeller Bldg.
BIRMINGHAM, ALA., Young & Vann Sup. Co.,
1809 First Ave.
BUMPER, ARIZ., Carl Clausen, Eng. Office.
CHICAGO, ILL., 650 McCormick Bldg.

DENVER, COLO., Mountain States Mach. Co.
PHILADELPHIA, PA., 1323 Widener Bldg.
SALT LAKE CITY, UTAH.
SAN FRANCISCO, CAL., E. A. Keithley,
Rialto Bldg.
TORONTO, ONT.

Valves, Fittings and Appliances of every description for Steam, Gas, Water, Air and Hydraulic Piping. Complete piping contracts executed—designed by experienced engineers, manufactured by skilled workmen under intelligent supervision and erected by expert fitters.

Special Valves and Sluice Gates for hydraulic installations, Motor Operated and Cylinder Operated. Hydraulic Operating Valves for blast furnace doors and bells, and for steel mill tables and rolls.

Special facilities for casting and machining large pipe fittings, furnace castings, etc.



Group of Motor-Operated Gate Valves

Pipe cutting, bending and welding. Branches and manifold outlets fabricated by the patented Interlock Method.



16" Welded Header with 18-4" Branches



PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

STANDARD LINES OF GATE VALVES

Specifications for material

Grey Iron—22,000 lb. per sq. in. tensile strength.

Semi Steel—33,000 lb. per sq. in. tensile strength.

Parallel seat
50 lb. working pressure
75 lb. test pressure

Sizes 14" to 72" cast iron. Low pressure. For water, gas, air or exhaust steam. Extremely close face to face, invaluable in complicated piping connections.

Parallel seat
125 lb. working pressure
300 lb. test pressure

Sizes 2" to 48" cast iron. Standard pressure. For water, air, steam or gas. Fully bronze mounted. Especially adapted to water distribution.

Parallel seat
200 lb. working pressure
400 lb. test pressure

Sizes 1½" to 16" cast iron. Largely used for natural gas under the lower pressures. Furnished either all iron or iron body bronze mounted.

Parallel seat
400 lb. working pressure
800 lb. test pressure

Sizes 3" to 20" semi steel. In extensive use for the transmission of natural gas. Furnished either with or without bronze mountings.

Parallel seat
500 lb. working pressure
1500 lb. test pressure

Sizes 2" to 12". For water or oil at pressure noted. Semi steel with solid bronze mountings.

Parallel seat
1000 lb. working pressure
1500 lb. test pressure

Sizes 2" to 12" semi steel. High pressure gas valve used chiefly at the gas wells and on feeders in the gas fields.

Parallel seat
1500 lb. working pressure
2000 lb. test pressure

Sizes 2" to 10" semi steel. For hydraulic service and extreme natural gas rock pressures.

Taper seat
175 lb. working pressure
500 lb. test pressure

Sizes 2" to 16" semi steel. A valve for medium steam pressures from 125 lb. to 175 lb. where a less expensive valve than the 250 lb. type is desired.

Taper seat
250 lb. working pressure
800 lb. test pressure

Sizes 1½" to 28" of semi steel with solid bronze mountings for ordinary steam pressures. Sizes 2" to 24" for superheat steam up to a temperature of 500 degrees Fahrenheit of cast steel with full monel mountings, monel stems and cooling chamber to protect packing.

Taper seat
1000 lb. working pressure
2000 lb. test pressure

Sizes 1½" to 12". The strongest valve possible to make in its weight, all surfaces being cylindrical or spherical segments.

Gate valves for any pressure

Designs and quotations furnished for valves for special conditions or higher pressures. Materials used are those best adapted to service.



50 lb. Parallel Seat Gate Valve. Close Pattern



14" Cast-Steel Gate Valve for Superheat Steam



4" 1000 lb. Gas Line Gate Valve

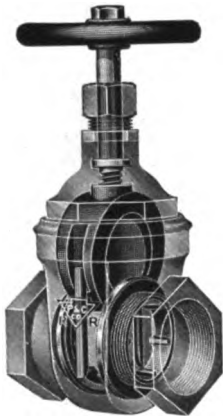


8" 1000 lb. Hydraulic Gate Valve

PRATT AND CADY CO., INC.

HARTFORD, CONN.

Manufacturers of Valves, Cocks and Hydrants



Renewable Seat Gate Valve

RENEWABLE SEAT GATE VALVES

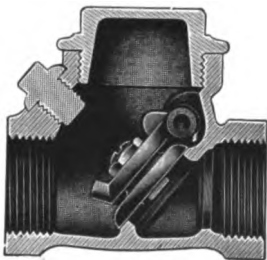
Bronze and Iron

All styles for all pressures. Sizes up to 24 inches. With renewable seat rings, held in place by separate retaining rings easily removable.

The seat rings are independent rings of bronze, or any special metal or material best adapted for the service in which the valve is to be used. The gate is a double-faced wedge-shaped casting, with side grooves by means of which it slides on guides in the valve body.

Gauges are used in machining all parts to insure their accuracy and interchangeability.

The guides in the bodies are of equal thickness, and the wedge can be taken out of the valve and replaced with the opposite faces in contact, and will give an accurate fit. The importance of this in making repairs is obvious. These valves being double seated, can be used with the pressure applied at either end.



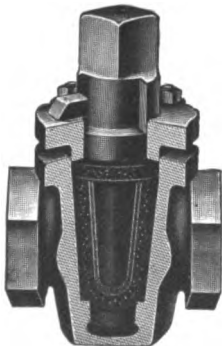
Regrinding Swing Check Valve

REGRINDING SWING CHECK VALVES

Bronze and Iron

All styles for all pressures, sizes up to 36 inches.

The design combines pressure resistance with easy flow lines. Material (of bronze valves) is 86% pure copper. Each valve is tested to an adequate pressure. All seats are carefully ground. Assembling is done by expert mechanics. The interior construction permits the replacement of any working part without removing valve from line. For regrinding no tool is necessary but a wrench, brace and bit.



Asbestos-Packed Cock

ASBESTOS-PACKED COCKS

Bronze and Iron

Made in sizes $\frac{1}{8}$ inch to 8 inches, for all pressures.

The dovetailed, U-shaped grooves in the body are packed with prepared asbestos. An asbestos ring is used on the shoulder of the plug for top packing.

The plug is of standard taper carefully finished and barfed to render it rustless. It has no metallic bearing, coming in contact only with asbestos, the elasticity of which compensates for the differential expansion and contraction of the plug and body. The gland admits of adjustment by means of its bolts.

These cocks give exceedingly satisfactory results as boiler blow-offs and water column blow-offs, between check and boiler, between water column and boiler, and they do work where ground plug cocks, globe, angle or gate valves fail.

PRATT AND CADY CO., INC.

BRONZE GLOBE AND ANGLE VALVES

Made in sizes $\frac{1}{8}$ inch to 3 inches for pressures to 250 pounds.

The stuffing box gland is long, heavy and well fitted.

The spindle collar, and its point of contact with the bonnet, have specially smooth surfaces and make a steam-tight joint when valve is fully open.

The disc holder is guided by four splines in the body, assuring perfect alignment at all times. The disc holder is of the horseshoe type, and can be removed and replaced, the only tool necessary therefor being a wrench to unscrew the bonnet.

The seat is rounded, thus preventing the settling thereon of any substance that might hold the disc from going squarely to its place. The bronze in these valves is approximately 86% pure copper.

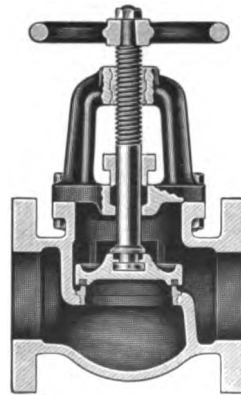


Bronze Globe Valve

IRON BODY GLOBE AND ANGLE VALVES

Made in sizes 2 to 8 inches inclusive for pressures up to 250 lbs.

The discs in these Valves are of the horseshoe type with an asbestos ring for pressures up to 150 lbs., and a copper ring for pressures up to 250 lbs. The disc holder is guided by four splines cast in the body which insures perfect alignment and prevents chattering. These Valves can also be provided with a steel spindle and an all iron disc, if so ordered. The seat rings as well as the discs are easily removable and renewable and this work may be done without removing the body from the line. We use the utmost care in machining and assembling these Valves and can thoroughly recommend them in places where other types of globe valves have not given satisfaction.



Iron Body Globe Valve

CAST STEEL GATE VALVES

(For Superheated Steam)

All tested to a hydrostatic pressure of 800 lbs., suitable for 250 lbs. pressure and 200 degrees superheat.

All valves $2\frac{1}{2}$ " to 6" are equipped with cast steel bodies, bonnets, yokes and nickel-bronze wedges.

Valves 7 inches to 16 inches have cast steel wedges.

The seats and faces of the wedges are made of nickel-bronze, securely fastened in place so that they cannot work loose.

Stems are cold rolled steel.

All bolt holes are spot faced.

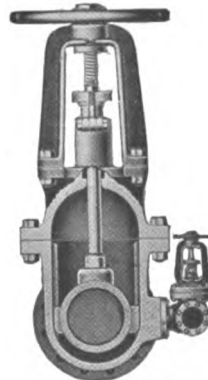
Bonnet joint is packed with the best grade of super-heat packing.

The end flanges have $\frac{1}{8}$ " raised faces, extending full width inside of bolt holes, with smooth finish.

All bolts have hexagon heads and nuts, with their under sides semi-finished.

The discs can be furnished either split or solid wedge pattern.

Stuffing box is made with hinge bolts, very deep for square packing.



Cast Steel Gate Valve

JOHN WILFERT CO.

W. GERARD HAWES, PRES. & GEN. MGR.

EXECUTIVE OFFICE

258 BROADWAY, NEW YORK

NEW YORK

BROOKLYN

GOSHEN

DAYTON

ST. LOUIS

Manufacturers of Valves, Fittings and Piping; Steam Engineering and Power Plant Equipment; Refrigeration and Hydraulic Specialties



Brass and Iron Seat Union

MALLEABLE GROUND JOINT UNIONS

No Gaskets Required

EXTRA HEAVY HYDRAULIC BRASS UNIONS

Tested to 2000 Pounds Cold Water Pressure.
Suitable for Working Pressures up to 800 Pounds.



Extra Heavy Hydraulic Union

HYDRAULIC VALVES

Bronze

Standard for Pressures to 5,000 Pounds

Special for Pressures to 20,000 Pounds

GLOBE AND ANGLE VALVES

For Ammonia

Hydro Steel Special Metal Discs
Cold Rolled Steel Stems Screw End



Stop Valve



Ammonia Valve

ACID METAL BRONZE FITTINGS

Heavy Pattern

STANDARD BRASS FLANGED FITTINGS

For 125 Pounds Working Pressure.



Bronze Fitting



Brass Flanged Fitting

STANDARD BRASS

SWINGING CHECK VALVES

Straight-Way

For 125 Pounds Working Pressure.



Swinging Check

EXTRA HEAVY BRASS HORIZONTAL AND ANGLE CHECK VALVES

"Hydro Bronze Metal."

Suitable for Steam Working Pressures up to 250 Pounds.



Extra Heavy Check Valve

JOHN WILFERT CO.

"REGRINDING" BRASS VALVES

Hydro Metal, Union Bonnet

For steam working pressures up to 200 pounds. Tested to 400 pounds hydraulic pressure.



Regrinding Brass Valve

"RENEWABLE" VALVES

Hydro Bronze

Self-Cleansing Seat

Regrinding and Renewable Seat and Disc

For working pressures up to 300 pounds.

Extra Heavy for working pressures up to 300 pounds.



Renewable Valve

IRON BODY GATE VALVES

Medium Pressure

Wedge Gate Pattern. Outside Screw and Yoke.

Brass Mounted, with or without By-Pass.

For Steam Working Pressures up to 175 Pounds.



Iron Body Gate Valve



Steel Gate Valve

STEEL GATE VALVES

Extra Heavy

Wedge Gate Type with Hydro Metal Trimmings for Saturated or Superheated Steam Construction.

IRON BODY VALVES

Brass Mounted

With Jenkins Standard Discs

EXTRA HEAVY

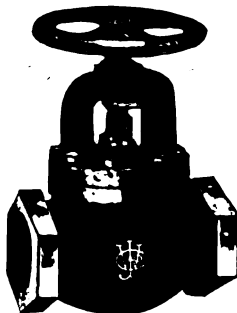
With Yoke

For 250 Pounds Working Pressure.

Tested to 800 Pounds Hydraulic Pressure per Square Inch.



Globe Valve, Screwed



Extra Heavy Globe Valve

ROE STEPHENS MFG. CO.

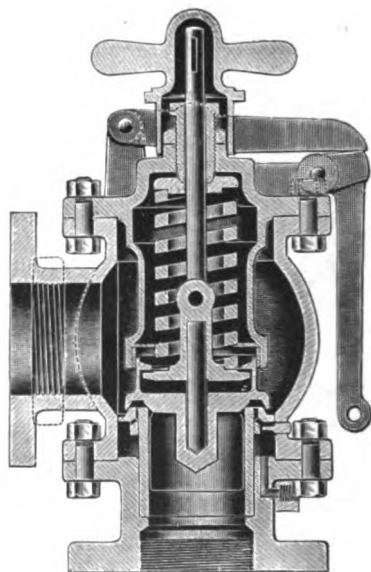
DETROIT, MICH.

Manufacturers of Valves for Steam, Water, Air and Gas

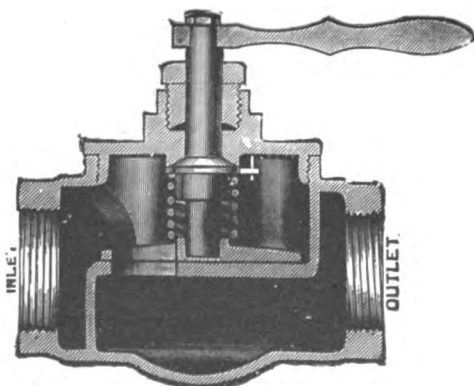
SCOTT'S HIGH GRADE VALVES

All Kinds and for All
Pressures

Straightway Gate, Globe, Angle,
Swing Check, Throttle, Hot Water
and Steam Radiator, Pop Safety
and Relief.



Scott Pop Safety Valve, Marine Type



Goldsmith Throttle Valve



Scott Pop Safety Valve

We make a full line of the Celebrated "Scott" pattern valves.

Send for our Catalogue and look over our Complete Line.

Scott Valve Co., 310 W. Randolph St., Chicago, Ill., Western Branch.

Blow-Off Valves, V-Notch Meters, Pipe-Joint Clamps, Etc.

YARNALL-WARING COMPANY

7603-20 QUEEN ST.

CHESTNUT HILL - PHILADELPHIA



POWER PLANT SPECIALTIES

Designed to promote economy and efficiency in the power plant.

Yarway Seatless Blow-Off Valve (formerly the Simplex)

Has neither discs nor seats. Port is larger than corresponding pipe and has no obstructions of any kind. Packing is in a protected position and will last for years without renewing. The Yarway operates easily, slowly and certainly. In closing valve, shoulder S on Plunger V engages the loose follower gland F, compressing packing P above and below the port, making an absolutely tight valve. Try one for 60 days subject to return. State size of line and whether screw or flange, angle or straightway.



Yarway V-Notch Meter with Lea Recorder



An accurate and simple device for measuring boiler feed water, condensate, commercial liquids, etc. The Lea Recorder provides permanent charts which supply the means of checking up wastes and suggesting economies of many kinds. A necessary part of every power plant striving toward fuel conservation.

Yarway Adjustable Spray Head (C. C. Thomas Patents)

Cools circulating water. Being adjustable, nozzles can be set to secure maximum cooling range under any conditions of temperature or humidity; thus a higher vacuum is maintained throughout the year, than is possible with rigid nozzles. Clogging is prevented as foreign matter can be blown out by operating levers from shore.

Yarway Automatic Boiler Skimmer

Automatically and continuously removes suspended matter from the boiler, thus largely preventing scale formation. It draws from boiler, the surface water which contains practically all impurities. The sediment slowly passes into precipitator, settling at the bottom, where it is blown off, without much waste of water. The purified water returns to boiler with little loss of heat.

Yarway Pipe-Joint Clamp (formerly the Simplex)

A dependable appliance that effectively stops bad pipe-joint leaks in lines containing steam, water, ammonia, gas, etc. Can be quickly and easily attached. First the housing 3 is placed on pipe and loosely clamped by bolts; next the follower 2 and packing ring 1 are laid on, and the whole placed against the leaky joint.

Bolts are then tightened and clamp secured against backing away by set screws 5. Lastly, packing is forced into threads at joint by tightening down on the set screws 4 until leak is completely stopped. Try one for 30 days, subject to return.



Yarway Hydraulic Valve (Caskey Patents)

Designed for use wherever hydraulic power is employed. It is pressure packed. Port affords full pipe area. The flow passes through the valve seat, not over it, thus reducing wear and lowering cost of maintenance. There are no stuffing boxes.

Yarway Starting and Pressure Unloader

(Richards Patents)

Cuts out all load until motor attains desired speed, thus smaller motor can be used. While motor is slowing down, cold air has free passage through cylinder, cooling it and preventing recoil. The Yarway is automatic and self-contained, being actuated by receiver pressure alone.

AMERICAN DISTRICT STEAM CO.

GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N. Y.

NEW YORK

CHICAGO

SEATTLE

Engineers—Contractors; "District Steam Heating Systems;" Steam Specialties

DISTRICT STEAM HEATING SYSTEMS

Electric Light, Power and Railway Companies are selling their Exhaust Steam during the heating months of the year for heating stores, offices, public buildings, schools, churches, residences, etc.

One of our representatives will be glad to call on you, make an investigation of your conditions and report on same.

STEAM SPECIALTIES

Steam Pipe Casing

Expansion Joints

Angle Joints

Adjustable Wedges

Cast Iron Pipe Fittings

"ADSCO" Radiator Valves, Graduated

Heaters "Water"

"ADSCO" Damper Regulators

St. John Indicating and Recording Steam Meters

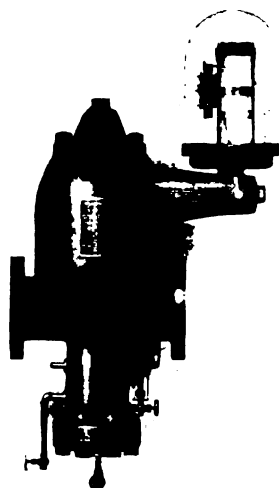
Condensation Meters

Steam Trap, High and Low Pressure

Reducing Valves, High and Low Pressure

Gauges—Mercury and Water

Cast Iron Steam Coils



St. John Indicating and Recording
Steam Meter

*Write for prices and
Book on "District Steam Heating"*



THE DOLE VALVE CO.

208 N. WELLS STREET, CHICAGO, ILL.

Manufacturers of Packless Radiator Valves & Double Compression Couplings

DOLE PACKLESS GRADUATED VALVE

The Ideal Valve for Vacuum or Vapor Steam Heating

The Dole Graduated or Modulating Valve is as carefully built as a watch—and as easily understood. Placed at the top of the radiator—where it is easily accessible without stooping—any degree of heat can be obtained with less than a half turn of the handle. Besides being the best-looking modulating valve, the Dole is the best constructed. Its packless feature—which has proved its utter practicability in over 250,000 installations—guarantees against leakage.

A short study of the sectional view shown will prove that in designing the Dole Packless Graduated Valve we have mastered all requirements necessary to make a perfect working Graduated or Modulating Valve.

Highly Finished

The Dole Modulating Valve is heavily nickeled and will retain its bright, handsome appearance indefinitely. Its exceptionally low height prevents it from protruding above the radiator.

Packless

A feature which has made the Dole a permanently leakless valve. Overcomes the "packing-in-the-stuffing-box" method of construction which has caused endless trouble and damage by its leakiness.

Should any adjustment be desired *after* the valve is fitted and installed, all that is necessary is simply to loosen octagon nut on top of dial with special wrench, which is furnished for the purpose, turn dial to left to the desired point, then tighten nut. This adjustment is easily made *while the steam is on*.

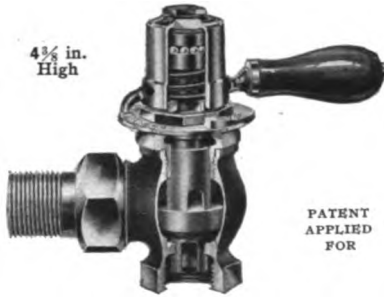
Made in $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", $1\frac{1}{4}$ ", $1\frac{1}{2}$ " and 2" sizes.

DOLE PACKLESS RADIATOR VALVES

Dole Packless Radiator Valves are made in Angle, Right-Hand Corner, Left-Hand Corner, Straight-way Globe, and Straight-way Gate Styles.

The sectional cut shown illustrates clearly the quick-opening feature, the double spiral thread, the one-piece rotating stem of properly proportioned size, and the manner in which the stuffing box of the ordinary valve has been eliminated.

Over 500,000 Dole Packless Radiator Valves are now in actual service.



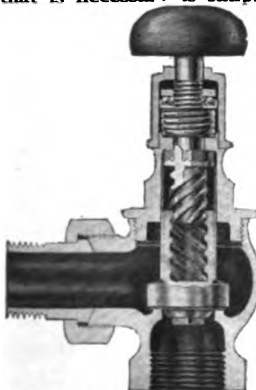
Dole Graduated Valve (Sectional View)

Durably Constructed

The Dole Valve is designed for practically everlasting service. The casting is of the best steam bronze—every detail carefully machined. The handle is made of selected mahogany.

Ball-Bearing

An exclusive feature. No matter how long the valve has been unused it can never stick or bind. When closed it shuts off absolutely tight.



Dole Angle Valve (Sectional View)

Send for our Catalogue.

AMERICAN STEAM GAUGE & VALVE MANUFACTURING CO.

FACTORY AND GENERAL OFFICES, BOSTON, MASS.

SALES OFFICES: NEW YORK, CHICAGO, ATLANTA, PITTSBURGH

Manufacturers of Steam Traps, Gauges, Valves, Indicators, and Kindred Appliances for Governing, Indicating, Measuring, Recording and Controlling Steam, Water, Air, Gas, Oil, Ammonia, and All Other Pressures



Bourdon Gauge

AMERICAN GAUGES are the simplest in construction, yet so designed that maximum efficiency with longest service is assured to the user. Gauges are too often judged or selected from superficial inspection only, with little or no attention to interior construction—the vital part. In American Gauges only the best material and workmanship will be found, as well as accuracy. This means dollars in every sense of the word to the owner in both operating and maintenance expense. We furnish gauges for every purpose, and especially invite inquiries for installations

where operating conditions are unusually severe. Estimates promptly furnished.

AMERICAN RECORDING GAUGES

The economical operation of power is safely guarded by the use of accurate, durable Recording Gauges. American Recorders are constructed in the same reliable, workmanlike manner that is characteristic of all our products. The style of case is the same as our non-recording instruments, thus giving uniformity to gauge board installations. Highest grade clock movements are used, insuring accurate time records. Standard chart 8 inch, 24 hour. Special charts to order. Each gauge fitted with our improved fountain pen requiring filling monthly. We specialize in engine room gauge boards complete, and invite inquiry.



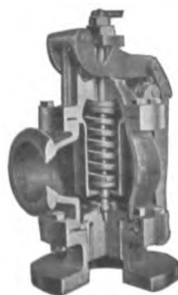
Recording Gauge

AMERICAN SPECIAL POP SAFETY VALVE

This valve is designed embodying the best features found in our experience during the thirty years of spring loaded safety valve existence. Constructed of the highest grade materials, tested under actual working conditions, simple, efficient, and of few working parts, all being easily accessible, and all adjustments made from outside valve casing. It is the best in valve construction.

This valve is also made in outside spring pattern for superheated steam.

Our sixty-five years' record is behind our guarantee covering all goods which we manufacture.



Sectional View

AMERICAN STEAM GAUGE & VALVE MANUFACTURING CO.

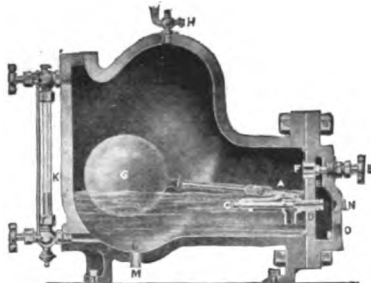
Established 1851

FACTORY AND GENERAL OFFICES, BOSTON, MASS.

AMERICAN IDEAL STEAM TRAP

The essential feature of this Trap is its valve leverage, which is many times more powerful than in any other Float Trap. This permits the use of floats sufficiently heavy to prevent possibility of collapse, and we make positive guarantee to this effect when traps are used on pressures for which they are intended.

The features of construction of this trap, both as regards valve leverage and design of shell or casing, insure unusually low upkeep or maintenance, and absence of trouble in operation.



Model C—Sectional View

AMERICAN RELIEF VALVES

Iron Body Brass Mounted

All Brass



Approved Underwriter



Standard



For Small Pumps



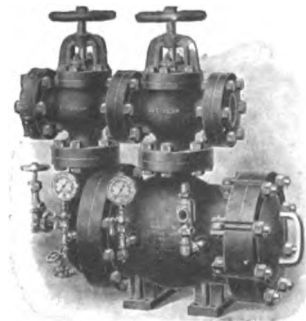
For Tanks, Etc.

143

AMERICAN H₂O GREASE EXTRACTING FEED-WATER FILTER

Designed for the efficient removal from feed water of grease which, after slight boiling, adheres in the form of "slugs" to boiler shell and flues. This filter has a filtering surface many times greater than area of the feed-water pipes, and occupies small space.

OPERATION—Under double filtration, filtering cages are covered with two layers of "Turkish toweling," which cloths are to be changed as often as conditions require. Temporary cleaning, however, may be effected by applying a reverse current of steam and drawing off the oil and grease while filter is in service. See illustration. Further particulars sent on request.



Grease Extracting Feed-Water Filter

JULIAN D'ESTE COMPANY

26 CANAL ST., BOSTON, MASS.

Brass Founders, Finishers and Machinists. Sole Manufacturers of Curtis Engineering Specialties

PRODUCTS: Damper Regulators, Improved Pressure Regulators, Improved Pump Regulators, Water Pressure Regulators, Expansion Trap, Return Steam Trap, Balanced Steam Trap, Relief Valve for Steam and Water, Steam Separator, Temperature Regulator, Pump Governor and Pump, Blower Valve, U. S. Ball Cock, Etc.

THE CURTIS IMPROVED (PATENT) DAMPER REGULATOR

The plunger is operated by steam direct from the boiler, and the whole pressure in the boiler is therefore available to operate the damper if needed. In practice, only enough pressure is used to lift the weight, usually not more than ten pounds to the square inch on the plunger.

The motion of the damper will begin to change from one direction to the other on a minimum variation of steam pressure.

We guarantee a saving of ten per cent of the fuel over the best hand regulation or the old style (diaphragm and lever regulator), and it often reaches fifteen per cent.

They are sent on thirty days' approval and will pay their cost by the saving of fuel in one year. Three Standard Sizes.



Damper Regulator



Steam Pressure Regulator

IMPROVED STEAM PRESSURE REGULATORS

This regulator is made entirely of metal, occupies the same space as a globe valve for the same size pipe, and is very simple and sensitive.

By its use steam may be maintained at high pressure in boilers, and yet be reduced for heating to two or three pounds.

In the best engineering practice the exhaust steam of the engine and elevator is turned into the heating system of a building, and the Regulator automatically supplies just the amount lacking to maintain constant pressure in the pipes and radiators.

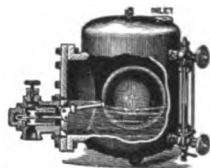
Standard sizes for $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, 4, 5, 6, 7, 8, 10 and 12 inch pipe.

A lockup top furnished at small additional cost.

THE CURTIS BALANCED STEAM TRAP

Some Points of Superiority

1. A perfectly balanced valve.
2. An absolutely frictionless valve.
3. The valve can be removed without breaking a joint, starting a gasket, or taking out a bolt.
4. The valve being frictionless and balanced, the whole power of the float is available for opening and closing it.
5. The copper float is perfectly spherical, as hermetically sealed as a glass globe, is of uniform thickness and warranted strong and tight at 250 lbs. pressure.
6. It has a pass-by valve to insure constant operation.
7. Each trap will operate perfectly on pressures varying from one to 250 pounds.



Balanced Steam Trap

PRICE LIST

Size and Condensing Capacity in		Feet of One-Inch Pipe	
No.	Capacity	inlet	outlet
No. 000,	\$15.00 for 1,000 feet	$\frac{1}{2}$ in.	inlet and outlet
No. 00,	20.00 for 2,000 feet	$\frac{3}{4}$ in.	inlet and outlet
No. 0,	25.00 for 3,000 feet	1 in.	inlet and outlet
No. 1,	30.00 for 5,000 feet	$1\frac{1}{4}$ in.	inlet and outlet
No. 2,	40.00 for 8,000 feet	1 in.	inlet and outlet
No. 2 $\frac{1}{2}$,	55.00 for 15,000 feet	$1\frac{1}{2}$ in.	inlet and outlet
No. 3,	75.00 for 30,000 feet	$1\frac{3}{4}$ in.	inlet and outlet
No. 4,	100.00 for 40,000 feet	2 in.	inlet and outlet
No. 5,	125.00 for 60,000 feet	3 in.	inlet and outlet
No. 6,	175.00 for 95,000 feet	4 in.	inlet and outlet

IDEAL AUTOMATIC GOVERNOR CO.

Incorporated

164 EMMET ST., NEWARK, N. J.

Manufacturers of Pump Governors, Pressure Regulating and Controlling Valves and Ideal Automatic Piston and Valve Rod Packing

"IDEAL" AUTOMATIC GOVERNORS

are oil-controlled, piston-actuated, pressure-controlling valves for governing pumps for salt and fresh water, oil, ammonia, air, gas, etc. They are extremely sensitive, with the patented exclusive feature of an oil body in the hydraulic pressure cylinder, against the lower head of the hydraulic-pressure-actuated piston which operates the valve in the power line to the pump. This body of oil prevents the liquid being pumped from reaching the hydraulic pressure cylinder, and thus prevents any sticking of the piston from corrosion or on account of grit or sediment in the liquid being pumped. An oil trap provides for settling of foreign matter, etc., and for retaining a sufficient body of oil in the cylinder to constantly bathe the cylinder walls, piston, and packing in lubricant. The material used in constructing governors for high duty service is Navy composition bronze or steel; for less exacting service, steam composition or cast iron.

"Ideal" Automatic Governors are constructed either to maintain a constant pressure (Style A) or to permit of variation of the pressure maintained as desired (Styles B, B-1, B-2) and are used for controlling automatic fire sprinkling system pumps, elevator pumps, turbine step-bearing pumps, hydraulic pumps, ammonia, gas and air compressors, and any other apparatus requiring sensitive, reliable automatic pressure control of steam, water or pneumatic power. They have been approved and adopted by the United States Navy and by the National Board of Supervising Inspectors of Steam Vessels, for controlling salt water fire pumps, salt water sanitary pumps, bulkhead collision door pumps, fresh water pumps, clutch pumps, hydraulic pumps, ash pumps, forced feed lubricating pumps, ammonia and air compressors, etc.

Special adaptations of the "Ideal" Automatic Governor have been made for a variety of purposes, including a stop valve for cutting off flow from pump when pressure falls, or vacuum is broken, by a break in delivery or suction line (Style C-S); a high pressure bypass relief valve taking pressure from accumulator side and by-passing when full travel of accumulator is reached or by-passing to atmosphere when electrically pumped liquids exceed maximum desired pressure (Style A-R); a double-safety, combining the principles of Styles A and C-S, providing automatic pressure control, and stopping pump if accident causes the pressure to fall below a fixed minimum (Style A-C-S); and many others.

Write for descriptive bulletins, showing all styles, and supply data regarding desired sizes, pressure to be controlled, purpose, etc., for prices.



Style "A"

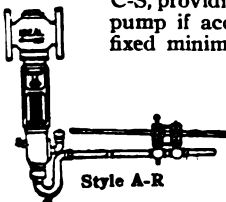
145



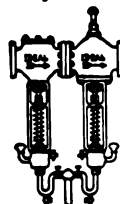
Style C-S



Style B-1 A



Style A-R



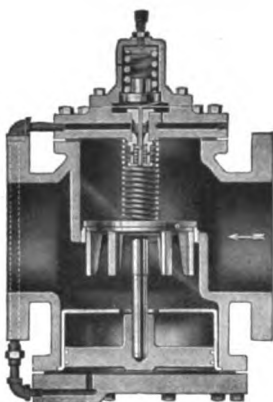
Style A-C-S

KIELEY AND MUELLER, INC.

34 WEST 13TH ST., NEW YORK CITY

Manufacturers of a Complete Line of High Grade Steam, Water and Air Specialties for Modern Heating, Power and Plumbing Installations

KIELEY HIGH PRESSURE PILOT REDUCING VALVE



No. 154

Kieley High Pressure Pilot Valves are suitable for marine service, where it is necessary to reduce high steam pressures for operating donkey engines, steering and hoisting engines, high speed electric generator engines, heating systems or other steam appliances used in connection with steam boats or power plant work.

Valve will positively respond to the slightest variation in pressure and will absolutely maintain the pressure at which it is set, regardless of what variation takes place in the initial pressure.

Working Pressures—Initial pressures, 250 lbs. or less. Minimum delivery or reduced pressure, 10 lbs. Maximum reduced pressure 90 per cent of the initial pressure.

Construction—For general use the valve bodies are made of the best quality of cast iron, and interior working parts of government bronze.

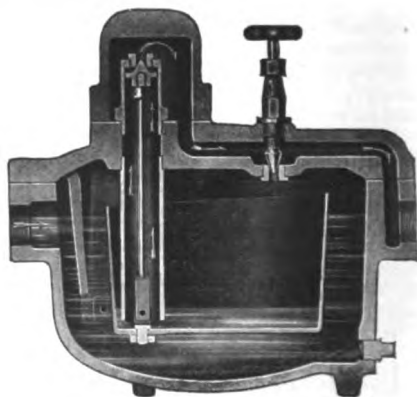
For extra high pressures or superheated steam work we construct the valve bodies of cast iron or cast steel with monel metal or nickel seats and discs. Prices furnished on application.

KIELEY EASY REPAIR STEAM TRAP

Construction—The Kieley Easy Repair Trap is the latest development in the art of steam trap construction. The important parts and those subjected to the greatest wear are placed high in the top of the trap so that by removing two nuts and the small cap all the parts are accessible and easily removed for repairs. Please note that all of this can be done without having to break any of the pipe connections or remove the cover.

In addition to the above advantages, which are strong points in favor of our traps, we construct the seats and discs of our standard traps of government metal, which is considered the highest grade metal in existence, absolutely non-corrosive, and for excessive high pressure or superheated steam work the seats and discs are constructed of nickel or monel metal, and the bodies of cast iron.

The valves in our traps close off absolutely tight and on account of their being protected by a water seal makes it impossible for any steam to escape from them when in service. This fact alone ought to be sufficient to assure the adoption of our traps in preference to all others, as a leaky trap is one of the most expensive devices you can have in your plant. All parts of our traps are interchangeable and can be obtained at a minimum cost.



No. 702

OTHER PRODUCTS

Reducing Valves for steam, water, air, etc.
Back Pressure Valves for all purposes.
Atmospheric Relief Valves for all purposes.
Steam Traps for all purposes.
Damper Regulators of various kinds.
Hot Water Temperature Controllers.
Steam and Water Separators.
Oil and Grease Extractors.
Pump Regulators.
Water Pressure Regulators.
Water Feeders.
Return Steam Traps.

Feed Water Regulators.
Grease and Oil Traps.
Emergency Valves.
High and Low Water Alarms.
Strainer Connections of various kinds.
Drip Tank Controllers.
Float Valves.
Tank Pump Controllers.
Pump Governors and Receivers.
Combination Muffler and Grease Extractor Tank, Receiver, Pump Governor, Pump and Feed Water Heater.
Grease Extractor and Purifier.

NOTICE—Trade Mark "KIELEY" appears on all our specialties, and they are known by that name. Kindly order or specify accordingly.

NEW COMPLETE CATALOGUE SENT ON REQUEST.

THE LESLIE COMPANY

LYNDHURST, N. J.

Founders and Manufacturers

PRODUCTS: "Leslie" Patent Pressure Regulator, Patent Removable Coupling Nuts and Sleeves, Bronze and Composition Castings, Engineering Specialties, High Pressure Steam Fittings, Etc.

THE "LESLIE" PATENT PRESSURE REGULATOR

For Steam or Air

Class "E," Bronze.—The "Leslie" Pressure Regulator, Class "E," is especially designed to deliver any desired pressure from a minimum of about ten pounds up to a maximum of 85 per cent. of the initial or boiler pressure up to 350 pounds per square inch, for all kinds of service, both in Marine and Stationary Service, including Saturated or Superheated Steam, Compressed Air and Oil under pressure to Burners, Journal Bearings, etc.

All "Leslie" Pressure Regulators, Class "E," are made in standard sizes from $\frac{1}{2}$ inch to 20 inch, inclusive, and are made exclusively of our special high pressure Steam Bronze throughout, except Springs, Bolts, Nuts and Capscrews. The Springs are made of a special steel and are made exclusively for the "Leslie" Pressure Regulators, and are then specially nickel plated.

Our Class "E" Regulators have met the most exacting and searching tests up to 500 pounds Hydrostatic, and 350 pounds working Steam Pressure, exacted by the United States and Foreign Navies, and in service where all other makes had failed they have proven so successful that they are specified by the leading Naval Architects, Marine Engineers and Mechanical Engineers, as well as the largest users of Reducing Valves in the world, who not only specify them, but insist upon "Leslie" Valves being installed.

147

Class "F," Iron Body.—Our Class "F" Regulators are designed for Stationary Service where Superheated Steam is not used and where the initial or boiler pressure does not exceed 200 pounds per square inch, and the reduced pressure to be delivered is not less than 10 pounds per square inch.

Similar in design to Class "E," except that it has a Bronze Liner in Cylinder and Bronze Main Valve Seat in Body, and is especially adapted to meet the growing demand for a reliable Reducing Valve in the Stationary Service. The Main Body, Top and Bottom Caps are made of a special high grade Cast Iron, all other parts of high pressure Steam Bronze, same as used in Class "E" Regulators, and are made in standard sizes from 4" to 20", inclusive.

Our Class "F" (Iron Body) Regulators can be found in the largest and most important Power and Steam Plants, Mills, Manufacturing and Mining Plants in this and foreign countries, where they have given results so satisfactory, that we guarantee them to do the work, for which they are intended, satisfactorily to our customers.

Class "H," Steam Heat Service.—Our Class "H" Regulators are designed for Steam Heat Service in Buildings, Compressed Air, Oil under pressure, etc., where the reduced pressure to be delivered is not less than 2 pounds nor more than 10 pounds per square inch.

Made in standard sizes from $\frac{3}{4}$ " to 10", inclusive, from $\frac{3}{4}$ " to 5", inclusive, they are made of the highest grade high pressure steam bronze throughout.

Above 5" they are made of a special high grade Cast Iron with Bronze fittings.

PACIFIC COAST AGENTS

Chas. C. Moore & Co., Engineers

San Francisco, Cal.

SARCO COMPANY, INC.

WOOLWORTH BLDG., NEW YORK

PHILADELPHIA

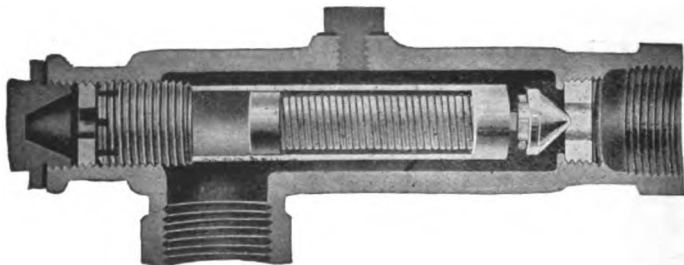
BUFFALO

DETROIT

CLEVELAND

CHICAGO

Steam Traps, Radiator Traps, Temperature Regulators, Metallic Gaskets



STEAM TRAP SARCO

The Steam Trap Sarco derives its operating force from the expansion and contraction of a heavy hydrocarbon oil hermetically sealed in a cartridge. The trap requires simply to be put in position and the cartridge unscrewed a few turns. When the steam has heated the cartridge, expanding the fluid and forcing out piston, the cartridge is gently screwed forward, closing off the steam. As soon as water collects, the liquid within the cartridge contracts, and the valve opens, discharging the water.

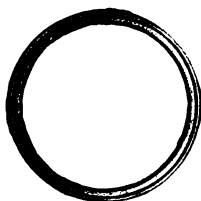
Low Pressure, 0 to 50 Lbs.

Size	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
List Price.....	\$6.00	\$6.00	\$9.45	\$11.25	\$24.15	\$30.00	\$38.70	\$51.75	\$60.00

High Pressure, 50 to 200 Lbs.

Size	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
List Price.....	\$7.75	\$7.75	\$10.35	\$12.00	\$28.50	\$34.50	\$48.30	\$60.00	\$75.00

SARCO METALLIC GASKETS

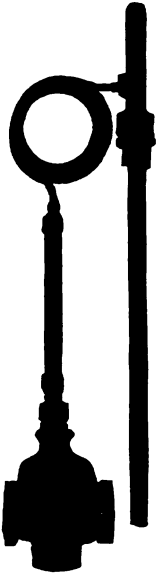


Are made for low and high pressure steam, superheated steam, oil, gas, water, and designed for union connections, flange connections, or made in any special shape. They have an inner ring of lead, reinforced by an outside copper ring, which prevents the lead from being blown out by the steam or squeezed out when being compressed. For superheat concentric rings of soft copper are used.

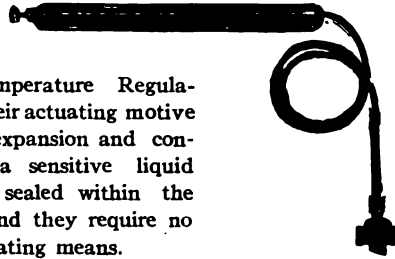


SARCO COMPANY, INC.

TEMPERATURE REGULATORS FOR LIQUID AND ATMOSPHERE



Type TR-21



Type KR-14

Designed Specially for Dry Kiln Work

Sarco Temperature Regulators derive their actuating motive power from expansion and contraction of a sensitive liquid hermetically sealed within the apparatus, and they require no exterior operating means.

Sarco Regulators are made in three standard types; for room temperature control, for dry kiln work and for tank control.

All are supplied for a given temperature and can be adjusted by the user for any temperature 10° F. above or 10° F. below that for which the regulator is calibrated at the works.

Type RR-7 is supplied for any desired atmospheric temperature between 50 and 100° F. The kiln regulator, Type KR-14, can be supplied for any desired temperature between 32° F. and 300° F.

The tank regulator, TR-21, can be used for any desired temperature of liquids and atmosphere between 32° F. and 300° F.

Sarco Temperature Regulators of other types can also be made to meet special conditions.

Type RR-7 Sarco Temperature Regulator for Atmosphere Up to 100° F.

Size of Valve.....	½"	¾"	1"	1¼"	1½"	2"
List Prices.....	\$40.00	\$45.00	\$50.00	\$60.00	\$70.00	\$90.00

Type KR-14 Sarco Temperature Regulator for Atmosphere Up to 300° F.

Size of Valve	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"
List Prices	\$60.00	\$65.00	\$70.00	\$75.00	\$85.00	\$95.00	\$110.00	\$130.00	\$170.00

Type TR-21 Sarco Temperature Regulator for Liquids and Dry Kilns

Size Inches	Weight Pounds	List Prices	Size Inches	Weight Pounds	List Prices	Size Inches	Weight Pounds	List Price
½	8	\$75.00	1½	22	\$95.00	3	51	\$135.00
¾	8	80.00	2	28	100.00	4	81	185.00
1	9	85.00				5	132	250.00
1¼	13	90.00	2½	37	115.00	6	158	300.00

RUSSELL B. HOBSON

NEW BRIGHTON, N. Y.

THE HOLLY GRAVITY RETURN SYSTEM

For the Return of High Pressure Condensation from Steam Piping to Boilers and for the Prevention of High Pressure Steam Leakages

When coal was \$3.00 per ton one of our clients found that by the installation of a Holly System in a plant then 5 years old he was able to save over \$400.00 a month.

This may be an extreme case, but many cases are extreme, and very many are so equipped as to surely become so, unless at the expense of constantly following up the ever-increasing leakages.

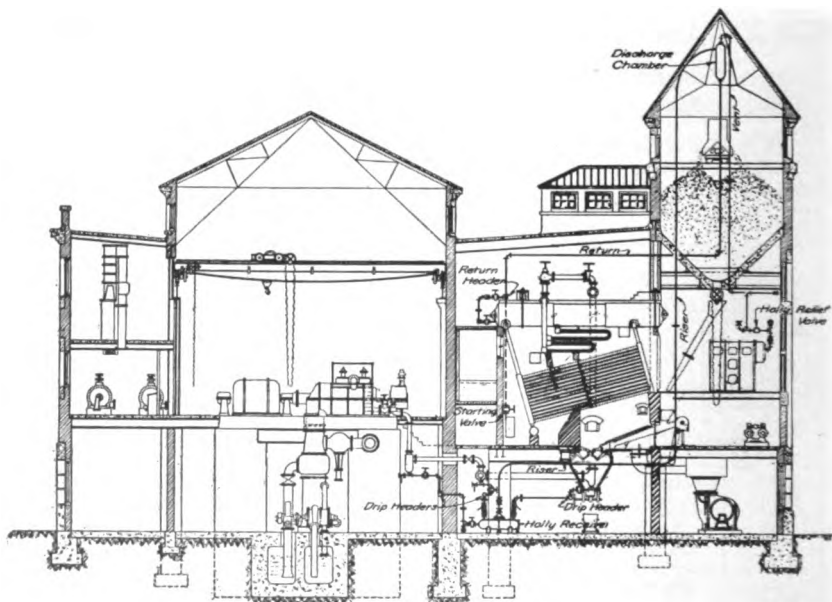
The Holly System has been described as "a principle in operation," having no mechanism to get out of order, and, having a very large capacity, it offers for these combined reasons the most reliable method of caring for high pressure steam piping.

When properly installed, the Holly System being a purely static device remains more nearly at 100% of its new condition than any other item of power plant apparatus.

We are supplying Holly Systems to several of the largest and most efficient plants now in course of construction.

Upon order we prepare the steam fitter's diagram from the Engineer's plans of the job and having laid out close on 500 Systems the proper form of installation is assured.

Send us details of your plant and let us quote you upon an adequate Holly System.

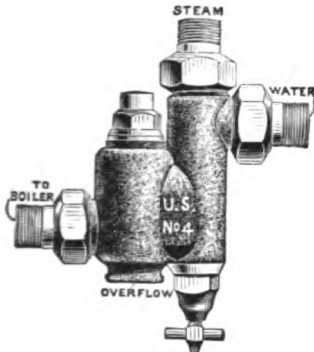


Typical Elevation of Holly Gravity Return System

AMERICAN INJECTOR COMPANY

DETROIT, MICH.

Manufacturers of Injectors, Ejectors, Jet Pumps, Drive Well Jet Pumps, Fire Plugs, Grease Cups, Oil Cups, Oil Pumps, Water Gauges, Air Cocks, Gauge Cocks, Lubricating Devices and Other Steam Specialties



U. S. Automatic Injector—
Regular Style

U. S. AUTOMATIC INJECTORS :

Have the following points of unquestionable superiority:

1. Easy to Operate
2. Wide Range
3. Absolutely Automatic
4. Never "Break" through Jarring
5. Backed by an Absolute Guarantee
6. Every Injector Carefully Tested

The utmost care is taken to see that every U. S. Injector leaving the factory shall be perfect in every respect. Each Injector is tested on different lifts and with various steam pressures. A card is attached to the Injector showing its range, and we guarantee every Injector to work as per attached card.

Other Distinctive Features are: 1. The Drip-Cock. 2. The construction of disk valve on delivery tube, which, being cup shaped, is forced to rise to its seat by the jets of water thrown against it from beneath. 3. The overflow valve, which never wears leaky.

Sizes range from $\frac{1}{4}$ "-3" pipe connection, with corresponding capacities of 36 to 5800 lbs. per hour at 80 lbs. steam pressure and three foot lift, water 76 deg.

Special High Steam Injectors to work to 300 lbs. steam pressure can be furnished to order. Also, injectors with special connections.

AMERICAN EJECTORS (Model B)

The American Ejector, because of its internal construction, gives superior service in raising water from deep wells, mines and pits or emptying tanks, raising and transferring liquids (hot or cold) in tanneries, dye houses, etc., or for priming centrifugal pumps.

The jets are made of a special hard bronze and can be renewed when worn, as the body of the Ejector will last indefinitely.



American Ejector—Model B

GAS ENGINE "EXPLOSO" OIL CUP

"Exploso" Gas Engine Oil Cup is especially designed and manufactured for the class of trade demanding a Lubricator of the highest type.

The filling arrangement consists of a sliding lid which makes the filling of the cup very simple and insures it being oil-tight. The sight feed opening is large and the shank is fitted with a large ball check valve to prevent back pressure entering the sight feed chamber. A baffle cap is also used which effectually muffles and diffuses any gas that may escape past the ball. With these improved features an even, constant flow of oil to the cylinder is insured.

"Exploso" Oil Cup The rate of feed can be adjusted by the milled regulating screw and ratchet holding same to place.

Catalogue No. 29, giving full details about U. S. Automatic Injectors and "The Engineers' Red Book," full of practical information for the Operating Engineer, will be promptly sent upon request.



PENBERTHY INJECTOR CO.

Established 1886

DETROIT, MICH.

N. Y. OFFICE
71 BREKMAN ST.

LONDON, ENGLAND

BRANCHES:

PARIS, FRANCE

CANADIAN PLANT
WINDSOR, ONT.

Manufacturers of Injectors, Ejectors, Valves, Cellar Drainers, Steam Specialties, Lubricating Devices and Carburetors



Automatic Injector

AUTOMATIC INJECTORS

Nearly a Million in Use

All our claims for the "Penberthy" Injector are based on actual tests, as we have set for this machine a very high standard, which for years has been steadily advanced, and the "Penberthy" to-day is better than ever before. Every "Penberthy" Injector is carefully tested before leaving the factory, and no machine is allowed to go out that will not work on the following points, while nearly all of them will do much better.

Start Low, 20 to 22 lbs. steam on 3-foot lift.
Work High, 165 to 170 lbs. steam on 3-foot lift.
Lift Water, 20 to 24 feet on 60 to 80 lbs. steam.
Handles Hot Water,
125° to 130° at 60 to 80 lbs. steam.
115° to 120° at 100 lbs. steam.
95° to 104° at 125 lbs. steam.

Made in all sizes from $\frac{1}{4}$ " to $2\frac{1}{2}$ ".

Only three wearing parts—quickly and easily repaired—parts interchangeable.
Special Injectors furnished where conditions are unusual.

XL-96 EJECTOR SIPHON OR STEAM JET PUMP

It would be difficult to enumerate all the uses to which our jet pump is adapted, but when we say that **anything and everything** in the nature of a liquid (if not too thick) can be transported from one level to another, or horizontally almost any distance, we have about covered the ground; therefore, the following factories, mills, etc., will see the advantage of adopting them, viz.: Chemical Works, Creameries, Cheese Factories, Tanneries, Mines, Well Diggers, Brickyards, Gas Works, Paper Mills, Steamboats, Breweries, Distilleries, etc.

Special Ejectors made of acid-resisting bronze and all iron.

Ten sizes— $\frac{1}{2}$ " to 4" suction discharge connections.

Will lift 22 to 25 feet. Elevate 30 ft. to 100 ft., 30 lbs. to 100 lbs. pressure.

Special Hydraulic Ejector for use with water pressure.



XL-96 Ejector

Send for complete catalog. Our Engineering Department is at your service.

PENBERTHY INJECTOR CO.

SAFEGUARD

Mechanically Correct

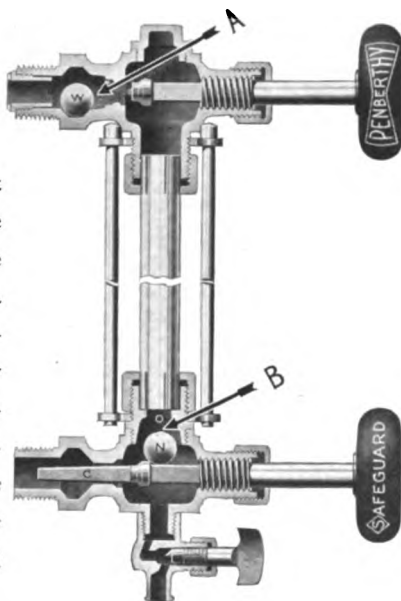
AUTOMATIC WATER GAGE

Equipped with Penberthy Dripless
Pet-Cocks

Note A: The upper ball valve seat is purposely designed so the passage can never be closed tight. When the glass breaks, this ball rests against a square or hexagonal opening, thus allowing a sufficient amount of dry steam to escape to equalize the pressure in the glass and the boiler pressure when new glass is inserted. *The balls positively cannot stay seated unless the glass is broken.* This is the vital point of "Operating Safety."

Note B: The lower ball valve seat is made absolutely tight, so that when the glass breaks, the lower ball closes this passage tight, and prevents the escape of steam and boiling water. The danger to the operator from scalding is eliminated, and from flying glass, altho not eliminated, is reduced to a minimum.

The "Safeguard" Gauge is all the name implies, and we recommend it for any and all uses where a high grade article is desired. We sell the large manufacturers of boilers, the jobbing trade and the U. S. Government.



Summary: The "Safeguard" construction is the result of 30 years of gage manufacturing. Note the facts: Balls are solid brass, properly proportioned to size of seat opening, and open by gravity; ball chambers spacious; projection on upper shut-off valve stem pushes ball off seat when closed by hand, and holds the ball momentarily off the seat when being opened after new glass is inserted, allowing full steam pressure to enter glass. Lower ball could not stay seated under these conditions.

A. M. BYERS COMPANY

PLANTS AND OFFICES, PITTSBURGH, PA.

SALES OFFICES

NEW YORK

BOSTON

CHICAGO

HOUSTON

LOS ANGELES

Distributors In All Jobbing Centers

Manufacturers of Byers Genuine Wrought Iron Pipe, Couplings and Nipples

GUARANTEE

All Byers pipe is guaranteed to be made exclusively from Byers pig iron, which is refined by hand puddling, rolled into muck bar and finally converted into skelp without the use of scrap in any of the processes of manufacture.

Every individual length of Byers pipe is guaranteed to have passed rigid inspection and testing, and to be full weight with a variation of not more than $2\frac{1}{2}\%$ below card weight.

Sizes, Weights, Etc.: Made in all sizes from $\frac{1}{8}"$ to 12", black and galvanized and in three weights; standard for all purposes where conditions of corrosion are normal, extra heavy for use where corrosion is severe or where more mechanical strength is required than is possessed by standard weight pipe, and double extra heavy for use where conditions are extremely severe either from a corrosion or mechanical standpoint.

Uses: For the conveyance of hot and cold water, steam, gases, air, oil, chemicals such as concentrated acids, salts in solution, solvents, etc. Byers can be used advantageously wherever welded ferrous pipe can be used, especially where corrosion is an important factor in determining the life of the pipe and where vibration and physical stresses crystallize and cause premature failure of soft steel pipe.

Advantages Summarized:

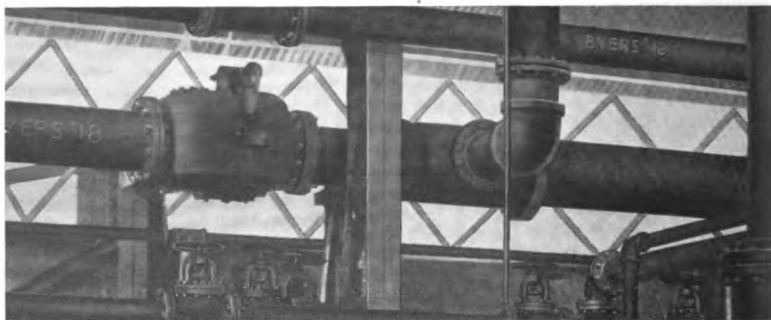
Great resistance to corrosion due to inclusion of finely divided non-corrosive slag filaments.

Resistance to crystallization and fracture under the influence of vibration and physical stresses due to its fibrous structure.

Easily threaded, cut and bent; perfect threads insure permanently tight joints.

Uniformly strong welds shown by test to be as strong as the body of the pipe.

Complete tables of sizes, weights, dimensions, and other literature on request.



Look for the Byers Name and the Year of Manufacture Rolled in Every Length

CENTRAL FOUNDRY COMPANY

90 WEST STREET, NEW YORK

CHICAGO

ATLANTA

SAN FRANCISCO

DALLAS

KANSAS CITY, MO.

Manufacturers of Universal Pipe, Soil Pipe, F. & W. Fittings, General Castings

UNIVERSAL PIPE



Sectional View of "Joint"
Showing Machined Universal
Joint with Bolts in Position
through Ends



TRADE
MARK

Universal Pipe is cast iron pipe with hub and spigot ends, the contact surfaces of which are machined on a taper giving a natural iron to iron joint, which is permanently tight. By making the tapers of slightly different pitch the joint provides for expansion and contraction, vibration and uneven ground settlement.

The lengths of pipe are drawn together by bolts, two bolts to a joint sufficing except for pressures above 175 pounds in some sizes. The pipe can therefore be laid at a slight labor cost, and without

calking. No molten lead, oakum, etc., required. No equipment, except two wrenches.

The iron to iron contact of the Universal Joint eliminates electrolysis. The result is a pipe that *does not leak, and continues not to leak*, with a joint that, as long as cast iron lasts, will remain tight under pressures even up to 500 pounds.

High Pressure Service: Universal Pipe is especially adapted to high pressure service, and particularly for high pressure fire lines. There is no packing to blow out, and nothing to deteriorate.

Subaqueous Work: Lines running under rivers or under water work of any kind are easily and economically laid by the use of Universal Pipe. In shallow water the joints can be made up under water if convenient.

Gas Systems: Universal Pipe is particularly advantageous in high and low pressure gas lines, by reason of the tight joint under differences of temperature and its freedom from electrolysis. The close contact of the smooth machined hub and spigot ends makes a joint through which gas cannot escape.

Curved Lines: Straight lengths of Universal Pipe may be laid on a curve of 150 feet radius.

SPECIFICATIONS

Nominal Inside Diameter	Class No. 100 100 Lbs. Pressure			Class No. 130 130 Lbs. Pressure			Class No. 175 175 Lbs. Pressure			Class No. 250 250 Lbs. Pressure			Bolt Sizes
	Approx. Thickness Inches	Estimated Weight Pounds per		Approx. Thickness Inches	Estimated Weight Pounds per		Approx. Thickness Inches	Estimated Weight Pounds per		Approx. Thickness Inches	Estimated Weight Pounds per		
		Foot	6-Ft. L'gth		Foot	6-Ft. L'gth		Foot	6-Ft. L'gth		Foot	6-Ft. L'gth	
2	..	..	..	..	..	..	.35	8½	51	.39	9½	57	½ x ¾
3	..	..	..	..	..	..	.37	13	78	.42	14½	87	½ x 1
4	.37	18	108	.40	18½	112½	.43	20½	121½	.45	21½	127½	½ x 1½
5	.40	24	144	.425	25	150	.45	26	156	.49	29	174	½ x 2
6	.43	30	180	.45	31	186	.47	32	192	.51	35½	213	½ x 2½
8	.47	44½	265½	.49	46	276	.525	49½	295½	.58	53½	319½	½ x 3½
10	.50	60½	363	.53	63½	381	.58	67½	406½	.64	74	444	1 x 7½
12	.53	75½	453	.57	80½	483	.62	87	522	.70	97½	585	1 x 8
14	.565	94½	567	.60	99½	597	.66	107½	64	.76	124	741	1½ x 9
16	.60	115½	693	.65	123	738	.72	134	804	.83	156	936	1½ x 9½
20	.67	166	996	.73	178	1068	.82	196	1176	.94	223	1338	1½ x 11½

Lengths lay a full six feet. All pipe tested with a minimum hydrostatic pressure of 300 pounds per square inch.

Special Castings are made with Universal hub and spigot openings, thus avoiding, except in extreme cases, the use of nipples. The lugs upon special castings are in one plane so that the branches or openings will all be in the same plane.

Approved by Fire Underwriters: Universal Pipe and Fittings have been tested and approved for fire protection service by the Underwriters' Laboratories which are under the direction of the National Board of Fire Underwriters.



U-165

LYNCHBURG FOUNDRY COMPANY

LYNCHBURG, VIRGINIA

MAIN OFFICE
LYNCHBURG, VA.

CHICAGO OFFICE
816 PEOPLE'S GAS BUILDING

EXPORT OFFICE
95 LIBERTY ST., N. Y.

WORKS—LYNCHBURG, VA.—RADFORD, VA.—ANNISTON, ALA.

Manufacturers of Cast Iron, Bell and Spigot Pipe and Fittings
Cast Iron Flanged Pipe and Fittings; Municipal Castings of every description
General Founders and Machinists

AMERICAN STANDARD CAST IRON FLANGED PIPE AND FITTINGS

Made in sizes from 1" to 60".

Standard fittings guaranteed for 125 lbs. working pressure.

Extra heavy fittings guaranteed for 250 lbs. working pressure.

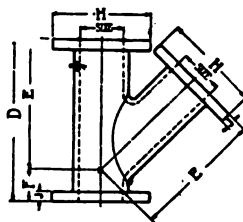
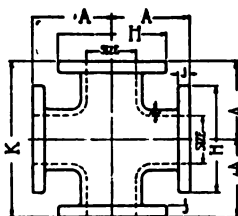
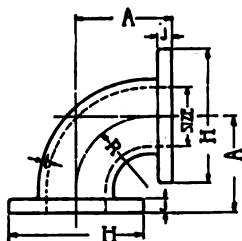


TABLE OF DIMENSIONS—STANDARD 125 LBS. PRESSURE

Standard Ells						Standard Crosses						Laterals						
SIZE	A	H	J	R	t	SIZE	A	H	J	K	t	SIZE	D	E	F	H	J	t
1	3 1/4	4	1 1/4	2 1/4	1 1/4	1 1/4	3 3/4	4 1/4	1 1/4	7 1/2	1 1/4	1 1/4	8	6 1/4	1 1/4	4 1/4	1 1/4	1 1/4
1 1/2	3 3/4	4 1/2	1 1/2	2 3/4	1 1/2	1 1/2	4	5	1 1/2	8	1 1/2	1 1/2	9	7	2	5	1 1/2	1 1/2
2	4	5	1 3/4	3	1 3/4	2	4 1/2	6	1 3/4	9	1 3/4	2 1/2	10 1/2	8	2 1/2	6	1 3/4	1 3/4
2 1/2	4 1/4	6	1 3/4	3 1/4	1 3/4	2 1/2	5	7	1 3/4	10	1 3/4	2 1/2	12	9 1/2	3	7	1 3/4	1 3/4
3	5	7	2	4	1 3/4	3	5 1/2	7 1/2	2	11	1 3/4	3	13	10	3	7 1/2	2	1 3/4
3 1/2	5 1/2	7 1/2	2 1/4	4 1/4	1 3/4	3 1/2	6	8 1/2	2 1/4	12	1 3/4	3 1/2	14 1/2	11 1/2	3	8 1/2	2 1/4	1 3/4
4	6	8 1/2	2 1/2	5	1 3/4	4	6 1/2	9	2 1/2	13	1 3/4	4	15	12	3	9	2 1/2	1 3/4
4 1/2	6 1/2	9	2 1/2	5 1/2	1 3/4	4 1/2	7	9 1/2	2 1/2	14	1 3/4	4 1/2	15 1/2	12 1/2	3	9 1/2	2 1/2	1 3/4
5	7	9 1/2	2 1/2	5 1/2	1 3/4	5	7 1/2	10	2 1/2	15	1 3/4	5	17	13 1/2	3 1/2	10	2 1/2	1 3/4
5 1/2	7 1/2	10	2 1/2	6 1/4	1 3/4	5 1/2	8	11	2 1/2	16	1 3/4	6	18	14 1/2	3 1/2	11	2 1/2	1 3/4
6	8	11	2 1/2	6 1/4	1 3/4	6	8 1/2	12 1/2	2 1/2	17	1 3/4	7	20 1/2	16 1/2	4	12 1/2	2 1/2	1 3/4
7	8 1/2	12 1/2	2 1/2	7 1/4	1 3/4	7	9	13 1/2	2 1/2	18	1 3/4	8	22	17 1/2	4 1/4	13 1/4	2 1/2	1 3/4
8	9	13 1/2	2 1/2	7 1/4	1 3/4	8	10	15	2 1/2	20	1 3/4	9	24	19 1/2	4 1/4	15	2 1/2	1 3/4
9	10	15	2 1/2	8 1/4	1 3/4	9	11	16	2 1/2	22	1 3/4	10	25 1/2	20 1/2	5	16	2 1/2	1 3/4
10	11	16	2 1/2	8 1/4	1 3/4	10	12	19	2 1/2	24	1 3/4	12	30	24 1/2	5 1/2	19	2 1/2	1 3/4
12	12	19	2 1/2	10 1/4	1 3/4	12	14	21	2 1/2	28	1 3/4	14	33	27	6	21	2 1/2	1 3/4
14	14	21	2 1/2	12 1/4	1 3/4	14	14 1/2	22 1/2	2 1/2	29	1 3/4	15	34 1/2	28 1/2	6	22 1/4	2 1/2	1 3/4
15	14 1/2	22 1/2	2 1/2	12 1/4	1 3/4	15	15	23 1/2	2 1/2	30	1 3/4	16	36 1/2	30	6 1/2	23 1/4	2 1/2	1 3/4
16	15	23 1/2	2 1/2	13 1/4	1 3/4	16	16 1/2	25	2 1/2	33	1 3/4	18	39	32	7	25	2 1/2	1 3/4
18	16 1/2	25 1/2	2 1/2	14 1/4	1 3/4	18	18	27 1/2	2 1/2	36	1 3/4	20	43	35	8	27 1/4	2 1/2	1 3/4
20	18	27 1/2	2 1/2	16	1 3/4	20	20	29 1/2	2 1/2	40	1 3/4	22	46	37 1/2	8 1/2	29 1/4	2 1/2	1 3/4
22	20	29 1/2	2 1/2	17 1/4	1 3/4	22	22	32	2 1/2	44	1 3/4	24	49 1/2	40 1/2	9	32	2 1/2	1 3/4
24	22	32	2 1/2	19 1/4	1 3/4													

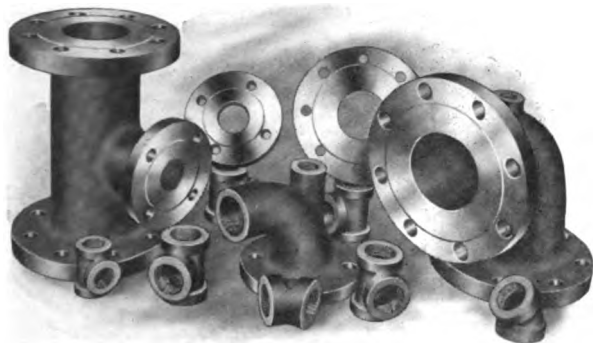
**AMERICAN WATER WORKS ASSOCIATION CAST IRON
BELL AND SPIGOT PIPE AND FITTINGS**

Catalogs mailed upon request

MALLEABLE IRON FITTINGS CO.

INCORPORATED 1864
BRANFORD, CONN.

Manufacturers of Malleable Iron Pipe Fittings for Gas, Steam and Water; Steel Fittings for High Pressure Service; Air Furnace Refined Malleable Iron and Semi-Steel Castings; Carbon and Alloy Steel Castings; Foundry Vibrators; Boat Hardware; Clamps; Oilers; and Hardware Specialties



EXTRA HEAVY FLANGES

For High Pressure Requirements

For Rolled, Shrunk or Welded Connection, bored, countersunk, grooved, faced and drilled to specification.

HIGH PRESSURE FITTINGS

Standard Sizes in Stock in Steel or Malleable

Machined, tested and ready for the line.

Specials made to order for railroad, manufacturing, mining, and municipal power plants in compliance with Lloyds Rules or Regulations of the U. S. Steamboat Inspection Service.

MALLEABLE IRON AND SEMI-STEEL CASTINGS

For Machinery; Automobile; Gun; Sewing-Machine; Overhead, Third-Rail, underground Electrical Construction and all miscellaneous work.

LOW CARBON STEEL CASTINGS

Equal to Crucible Steel Castings.

SPECIAL METAL "A"

For Gears and Cams where resistance to wear is wanted. May be heat-treated to required hardness.

AIR FURNACE REFINED VANADIUM IRON

For Piston Heads, Piston Rings, and Cylinders. Has a high tensile strength and is tough, sound, and dense. Especially adapted for Forging Dies and Heavy Service Gears.

CUSTOM AND JOBBING DEPARTMENT

Galvanizing, Tinning, Japanning, Contract Machining of Malleable Iron, Grey Iron, Wrought Iron, and Steel. Galvanized Nails—Marine Hardware.

PENNSYLVANIA FORGE CO.

OFFICE AND WORKS: BRIDESTOWN, PHILADELPHIA, PA.

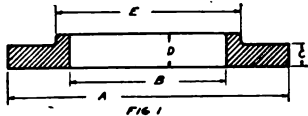
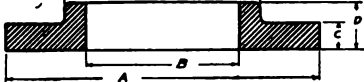
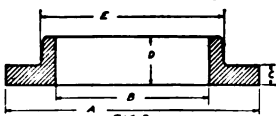
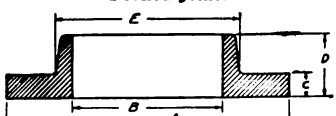
Manufacturers of Steel, Bronze and Monel Forgings

FORGED STEEL FLANGES

Dimensions shown below have been recommended as standard by the A. S. M. I.
Flanges are smooth forged to the given sizes, except additional material is allowed on the face for finishing. Any dimension may be increased as desired.

Flanges of other dimensions furnished on specification.

We are prepared to furnish flanges completely machined, including facing, drilling and threading.

TYPE	Nominal Size Inches	Outside Diam. A	Diam. Bore B	Thk-ness C	De'th of Hub D	Diam. of Hub E	W'gt Lbs.
Standard Low Hub For Screwed or Rolled Joints  FIG. 1	2	6	2 1/4	5/8	1	3 1/4	7
	2 1/2	7	2 1/2	1	1 1/4	3 3/4	9
	3	7 1/2	3 1/4	1 1/8	1 1/2	4 1/4	10
	3 1/2	8 1/2	3 3/4	1 1/4	1 3/4	4 3/4	14
	4	9	4 1/4	1 1/2	1 3/4	5 1/4	16
	4 1/2	9 1/4	4 3/4	1 3/4	1 3/4	5 1/2	17
	5	10	5 1/4	1 3/4	1 3/4	6 1/4	19
	6	11	6 1/4	1 3/4	1 3/4	7 1/4	23
	7	12 1/2	7 1/4	1 3/4	1 3/4	8 1/4	31
	8	13 1/2	8 1/4	1 3/4	1 3/4	9 1/4	36
	9	15	9 1/4	1 3/4	1 3/4	10 1/4	44
	10	16	10 1/4	1 3/4	1 3/4	11 1/4	51
	12	19	12 1/4	1 3/4	2 1/4	14 1/4	74
	14	21	13 1/4	1 3/4	2 1/4	15 1/4	96
Extra Heavy Low Hub For Screwed or Rolled Joints  FIG. 2	2	6 1/2	2 1/4	7/8	1 1/4	3 3/4	10
	2 1/2	7 1/2	2 1/2	1	1 1/4	4 1/4	14
	3	8 1/4	3 1/4	1 1/8	1 1/2	4 3/4	17
	3 1/2	9	3 3/4	1 1/4	1 3/4	5 1/4	21
	4	10	4 1/4	1 1/2	1 3/4	5 1/2	28
	4 1/2	10 1/4	4 3/4	1 3/4	1 3/4	6 1/4	31
	5	11	5 1/4	1 3/4	1 3/4	6 1/2	33
	6	12 1/2	6 1/4	1 3/4	2	7 1/4	54
	7	14	7 1/4	1 3/4	2 1/4	9 1/4	54
	8	15	8 1/4	1 3/4	2 1/4	10 1/4	62
	9	16 1/4	9 1/4	1 3/4	2 1/4	11 1/4	73
	10	17 1/2	10 1/4	1 3/4	2 1/4	12 1/4	83
	12	20 1/2	12 1/4	1 3/4	2 1/4	14 1/4	123
	14	23	13 1/4	1 3/4	2 1/4	15 1/4	160
Standard High Hub For Shrunk or Peened Joints  FIG. 3	4	9	4 3/4	1 1/4	2 1/4	5 1/4	20
	4 1/2	9 1/4	4 3/4	1 1/4	2 1/4	6 1/4	21
	5	10	5 1/4	1 1/4	2 1/4	6 1/2	23
	6	11	6 1/4	1 1/4	2 1/4	7 1/4	27
	7	12 1/2	7 1/4	1 1/4	2 1/4	9	34
	8	13 1/2	8 1/4	1 1/4	2 1/4	10	40
	9	15	9 1/4	1 1/4	2 1/4	11 1/4	48
	10	16	10 1/4	1 1/4	3	12 1/4	56
	12	19	12 1/4	1 1/4	3 1/4	14 1/4	88
	14	21	13 1/4	1 1/4	3 1/4	15 1/4	110
	15	22 1/2	14 1/4	1 1/4	3 1/4	16 1/4	122
	16	23 1/2	15 1/4	1 1/4	3 1/4	18	140
Extra Heavy High Hub For Van Stone, Single Riveted, Shrunk or Peened Joints  FIG. 4	4	10	4 3/4	1 1/4	3 1/4	5 1/4	28
	4 1/2	10 1/4	4 3/4	1 1/4	3 1/4	6 1/4	34
	5	11	5 1/4	1 1/4	3 1/4	7	37
	6	12 1/2	6 1/4	1 1/4	3 1/4	7 1/4	45
	7	14	7 1/4	1 1/4	3 1/4	9 1/4	55
	8	15	8 1/4	1 1/4	3 1/4	10 1/4	62
	9	16 1/4	9 1/4	1 1/4	3 1/4	11 1/4	74
	10	17 1/2	10 1/4	1 1/4	3 1/4	12 1/4	90
	11	18 1/2	11 1/4	1 1/4	3 1/4	13 1/4	112
	12	20 1/2	12 1/4	1 1/4	4	14 1/4	131
	14	23	13 1/4	1 1/4	4 1/4	16 1/4	182
	15	24 1/4	14 1/4	1 1/4	4 1/4	17 1/4	196
	16	25 1/4	15 1/4	1 1/4	4 1/4	18 1/4	223
	18	28	17 1/4	2	5	20 1/4	295

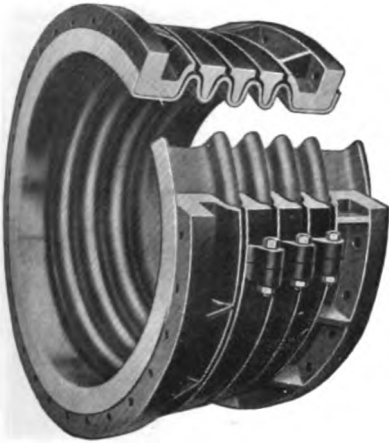
Also Connecting Rods, Piston Rods, Crank Shafts, Rolls, Die Blocks, Hammered Bars, Weldless Rings, Spindles, Etc.

E. B. BADGER & SONS COMPANY

BOSTON, MASS.

NEW YORK OFFICE: 101 Park Avenue

Manufacturers of Badger Equalizing Expansion Joints for High and Low Pressure



Face to Face Dimensions

Size	Two corrugations	Three corrugations	Four corrugations
6"	12½"	16"	19"
8"	12½"	16"	19"
10"	12½"	16"	19"
12"	13"	16½"	20"
14"	13½"	17"	20"
16"	13½"	17"	20"
18"	14"	17½"	21"
20"	15"	18½"	21½"
22"	15"	18½"	21½"
24"	15½"	19"	22"

159

BADGER EQUALIZING EXPANSION JOINTS are made

two corrugations to care for 1" expansion.

three corrugations to care for 1½" expansion.

four corrugations to care for 2" expansion.

They are {
SIMPLE—there are no complicated parts.
DURABLE—made of best quality copper.
SAFE—hydraulic test on every joint.
CONVENIENT—installed as easily as any flange fitting.
COMPACT—greatest diameter is usually less than the flange.
EFFICIENT—they require no packing.

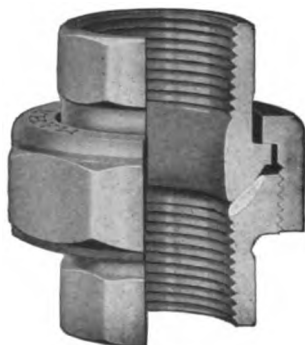
Badger Joints are also made with single corrugation for connection between turbines and condensers, and designed for any special requirements.

Write for our catalog No. 12.

MARK MANUFACTURING CO.

P. O. Box G, CHICAGO, ILL.

Makers of Wrought Pipe and Couplings, Boiler Tubes, Electric Wire Conduit, Well Casing, Well Points, Pump and Well Cylinders, Well Strainers, Well Valves and Tools, Pipe Cutters, Vises, Threading Dies, and Pump and Well Supplies



THE MARK COLD DRAWN STEEL PIPE UNION

Leakless — Rustless — Different

Cold drawn from rolled steel, the logical material for fittings used on steel Pipe

It will not leak, break or corrode—BECAUSE:

1. It will expand and contract in *exactly the same degree* as steel pipe with which it is used, consequently it is not subject to leakage at threads, which is unavoidable where malleable and brass unions are used with steel pipe.

2. It is entirely free from blow holes and sand holes, defects common to all types of unions made of malleable iron and cast brass.

3. It has a steel-to-brass seat, the brass ring being actually welded to the steel in which it is embedded.

4. The threads are accurately cut, and have the same taper as the pipe.

5. It is designed to carry high pressure as well as low, and all sizes are equally strong.

6. All surfaces, including all the threads, are rust-proofed. Therefore, the Mark Union will not rust or freeze to the Pipe.

SIZES AND LIST PRICES

Pipe Size	$\frac{1}{8}$ "	$\frac{1}{4}$ "	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	$1\frac{1}{4}$ "	$1\frac{1}{2}$ "	2"
	.30	.30	.40	.50	.60	.80	1.20	1.60	2.00

FRANKLIN WILLIAMS, INC.

41 CORTLANDT ST., NEW YORK

Manufacturer of Engineering Specialties

**SWING JOINTS
UNIONS
EXHAUST HEADS**

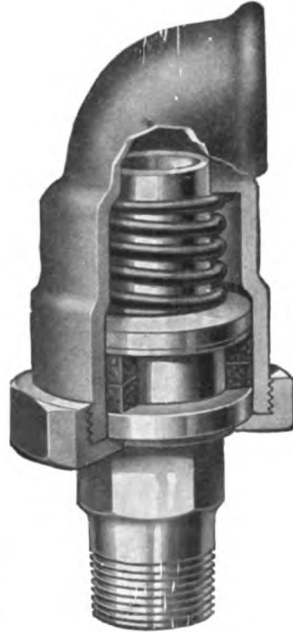


**PRESSURE REGULATORS
DAMPER REGULATORS
AUTOMATIC VALVES**

TUXEDA SWING JOINT

A standard all-bronze flexible Joint for conducting steam, water, oil, or gas, that makes possible a permanent installation of flexible piping. The leak-proof qualities of this joint are unaffected by rapid temperature changes which makes it the only serviceable and satisfactory connection for heating and chilling presses.

The sectional cut shows the interior construction of the Joint. A feature of this construction is the complete protection of the packing from wear. The packing remains stationary in the Joint, protected on top and bottom by wear-protecting ring washers or glands. Thus the turning of the spindle exerts its wearing effect on the wearing rings and not on the packing, with exception of the inner cylindrical surface of the packing. Furthermore only such proper pressure as necessary to hold a tight joint is exerted upon the packing. No destructive pressures can be applied to the packing by tightening of the gland which greatly adds to the life of the Joints. When repacking is necessary it can be accomplished in a few minutes without disturbing connecting piping.

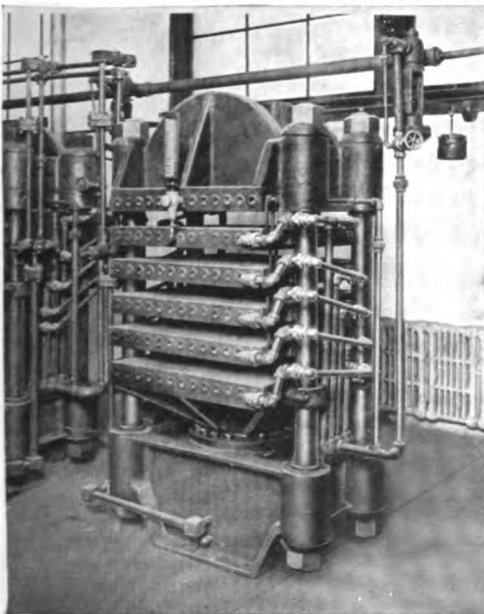


161

Tuxeda Swing Joints are being successfully applied to the following:

- Celluloid Polishing Presses
- Celluloid Cake Presses
- Vulcanizing Presses
- Condensite Moulding Presses
- Bakelite Moulding Presses
- Hat Blocking Presses
- Veneer Presses
- Woodbending Presses
- Glue Presses
- Clothes Presses
- Textile Finishing Presses
- Steam Traps
- Oil Burners
- Tire Heaters
- Mechanical Rubber Presses
- Laundry Machinery
- Etc.

Illustration shows Tuxeda Swing Joints applied to Rubber Sole and Heel Press



H. W. JOHNS-MANVILLE CO.

NEW YORK CITY

Branches in 61 Large Cities

Asbestos and Magnesia Products

Power Plant Specialties

Johns-Manville Service to power-users has its effect in reducing the expense of plant maintenance. It acts through power conservation right back to the ultimate reduction of your bills for fuel and labor.

Johns-Manville Service embraces a complete line of maintenance materials designed to save heat, friction, wear and labor. The service rendered by each of these products is assured by Johns-Manville Responsibility, a business principle that places the user's satisfaction above all other considerations.

JOHNS-MANVILLE INSULATIONS

Heat Insulations

Asbesto-Sponge Felted Insulation (sectional, sheets and blocks)

85% Magnesia Insulation (sectional, sheets and blocks)

Asbestos Fire-Felt Insulation (sectional, sheets and blocks)

Thermo Fire-Felt Insulation (sheets and blocks)

Vitribestos Insulation and Stack Lining (sectional, sheets and blocks)

Asbestocel Insulation (sectional, sheets and blocks)

Air-Cell Insulation (sectional, sheets and blocks)

Wool Felt Insulation: Standard, Champion, Aqua (sectional)



Johns-Manville Asbesto-Sponge Felted Pipe Covering

One of the Johns-Manville line of Pipe Insulations

Cold Insulations

Brine and Ammonia Pipe Insulation (built-up)

Anti-Sweat Insulation (sectional)

Zero Insulation (sectional)

JOHNS-MANVILLE POWER PLANT SPECIALTIES

Steam Trap

Asbesto-Metallic Brake Blocks

Refractory Cements

Airtite Boiler Wall Coating

Stack Preservative

Vulcabeston Pump Valves

JOHNS-MANVILLE PACKINGS

Sea Rings Rod Packing Ring, Spiral or Coil

Sheet Packings and Gaskets



Kearsarge

Universal

Duplex

Mogul

Jewett

Service

Seigelite

Asbesto-Metallic

Asbestos Fibre

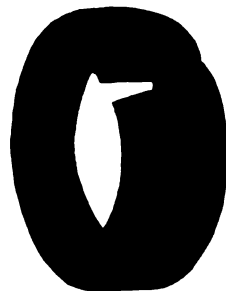
Mobilene

Liberty Red Rubber

and Asbestos Wick and Rope Packing

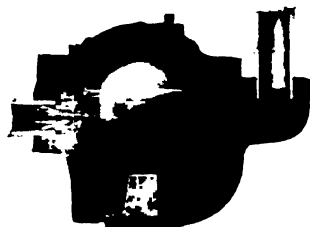
Other Johns-Manville Products:

"Noark" Fuses and Electrical Materials, Asbestos Roofing and Siding, Fire Extinguishers.



Johns-Manville Sea Ring

An automatic steam, air and hydraulic packing



Johns-Manville Steam Trap

Only three parts—the body, the rolling ball and the discharge bushing—nothing to get out of order

Johns-Manville Fire Extinguisher

Instantly extinguishes any type of incipient blaze



A. WYCKOFF & SON CO.

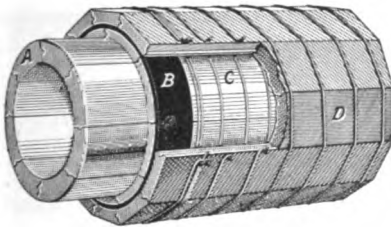
Established 1855

ELMIRA, NEW YORK

Manufacturers of Steam Pipe Covering, Wood Water Pipe

WYCKOFF'S IMPROVED STEAM CASING FOR UNDERGROUND OR EXPOSED STEAM LINES

Made of Gulf Cypress, The Wood Eternal



A—2 Inch Thick Inner Shell.
C—Dead Air Space.

B—Asphaltum Packing.
D—1 Inch Thick Outer Shell.

163

Gulf Cypress is used instead of Pine or Tamarack because Gulf Cypress is the only known wood not affected by Wet or Dry Conditions. The outer shell is one inch thick, the inner shell two inches and the dead air space $\frac{1}{4}$ inch, making the total thickness of the casing $3\frac{1}{4}$ inches. These improvements will more than double the life of former Wyckoff casings. The asphaltum packing and the driven joint make the casing absolutely waterproof.

We make the casing in lengths of from four to eight feet. The lengths are connected by tenon and socket joints. In putting over the pipes it requires simply to be driven together.

This pipe casing is the ONLY ONE on the market with

$\frac{1}{4}$ " DEAD AIR SPACE BETWEEN THE SHELLS.

Send for our booklet to-day—it tells you all about these improvements.

THE MAGNESIA ASSOCIATION OF AMERICA

721 BULLETIN BUILDING, PHILADELPHIA, PA.

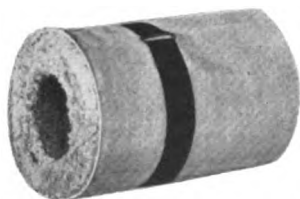
Manufacturers of "85% Magnesia" Insulations

Objects of the Association

To improve the practise of heat-insulation for power-plants and for general heating by disseminating information as to the heat-saving qualities of Magnesia Pipe- and Boiler-Coverings (known as "85% Magnesia"), and to expertly investigate the problems of correct heat-insulation with a view to still further possible improvement in the provision of the most suitable coverings, especially with regard to superheat and high-pressure steam.

"85% MAGNESIA" INSULATIONS

For Pipes and Boilers



Modern heat-insulation dates from the invention of "85% Magnesia" coverings thirty years ago.

This product embodies, in its highest form, the basic principle of "dead air" which is universally recognized as the foundation of heat-insulation efficiency.

The millions of microscopic dead-air cells contained in a single square foot of "85% Magnesia" covering offer an impenetrable barrier to the loss of heat from pipes or boilers. The efficiency of "85% Magnesia" coverings is not subject to impairment through lapse of time, or through the effects of heat and moisture, steam- or water-leakage or other incidents of service.

Their durability is attested by the fact that in many instances they have outlasted the metal which they protected. It is not at all an infrequent occurrence for "85% Magnesia" coverings to be removed from old steam-lines and replaced on the new pipes. Therefore they may in every case be considered as an investment, at least as stable as that involved in any other item of the steam-plant.

"85% Magnesia" coverings are supplied in sectional, segmental or block form, also as plastic magnesia for fittings, etc.

THE MAGNESIA ASSOCIATION OF AMERICA

THE STANDARD SPECIFICATION OF THE MAGNESIA ASSOCIATION OF AMERICA

This is the only authoritative specification ever published for the correct covering of pipes, boilers, fittings, etc., for every kind of steam service. A copy should be in the files of every heating and power engineer. It will be sent on request. The following tables are abridged from the specification:

"85% MAGNESIA" COVERINGS FOR STEAM-PIPES

For	Size of Pipe	1st Coat	Kind	Extra Covering	Total
Pressures to 100 lbs. *(Standard thickness)	1/4 in. to 1 1/2 in.	3/8 in.*	Sectional	.....	3/8 in.
	2 in. to 3 1/2 in.	1 1/8 in.*	Sectional	.....	1 1/8 in.
	4 in. to 6 in.	1 3/8 in.*	Sectional	.....	1 3/8 in.
	7 in. to 10 in.	1 1/2 in.*	Sectional	.....	1 1/2 in.
	Larger sizes	1 1/2 in.	Segments	.....	1 1/2 in.
Pressures 100-150 lbs.	All sizes	Double	Standard T	thickness	
Pressure 150 lbs. and over	All sizes	1 1/2 in.	Sectional	1 1/2 in. Sectional	3 in.
Superheat	All sizes	Double 1 1/2 in.	Sectional	1/2 in. Plastic	3 1/2 in.
Drips (Saturated)	All sizes	1 1/2 in.	Sectional	.....	1 1/2 in.
Drips (Superheat)	All sizes	1 1/2 in.	Sectional	1/2 in. Plastic	2 in.

"85% MAGNESIA" COVERINGS FOR BOILERS, DRUMS AND FITTINGS

For	1st Coat	Kind	Extra Covering	Total
Boilers, Drums and Breechings	2 in.	Block	1 in. plastic	3 in.
Drum-ends Boiler-walls	3 in. 2 in.	Block and plastic, or all plastic	.....	3 in. 2 in.

FITTINGS for saturated steam 150 lbs. and over and for superheat, cover with 2 1/2" blocks or plastic. Under 150 lbs., 2"; under 100 lbs., standard thickness. FLANGES, cover 2" thick on built-up foundation of wire netting. EXHAUST fittings or flanges, as pipe.

In addition to the specification, the Magnesia Association has also prepared a handbook on heat-insulation, under the title "Let '85% Magnesia' Defend Your Steam." It contains a brief outline of the principles and practise of heat-insulation together with much other valuable information, never before published. A copy will be forwarded on application.

Executive Committee of the Association

WILLIAM A. MACAN, *Chairman*

GEORGE D. CRABBS The Philip Carey Co. Cincinnati, Ohio
ALVIN M. EHRET Ehret Magnesia Mfg. Co. Valley Forge, Penna.
J. R. SWIFT The Franklin Mfg. Co. Franklin, Penna.
R. V. MATTISON, JR. Keasbey & Mattison Co. Ambler, Penna.



THE PICKERING GOVERNOR CO.

PORTLAND, CONN.

Manufacturers of Governors for Steam Engines and Turbines, Gas Engines, Mechanical Control and Speed Limit

THE PICKERING GOVERNOR

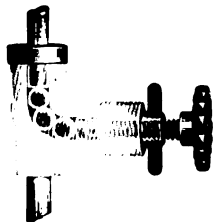
Owing to the absence of joints our Governors are very responsive to slight changes in load, moving quickly and positively into correct position for maintaining the admission of steam proportionate to the duty required of the engine. Absence of joints gives maintenance in efficiency under continued and severe duty.

Greatest range in speed adjustment with close regulation at all points.



Fig. 33

Class B represents Governor with Speed Ranges by use of which the speed of Engine can be varied while in motion. Sawyer's Lever is also included



Detail of the Speed Ranges



Fig. 34

Class A, to which is added the Automatic Safety Stop. This Stop closes valve when belt breaks or runs off Pulley, and is simple and certain in its action

All Governors equipped with Wide Range Speed Changer.
U. S. & Foreign Patents.

TABLE OF DIMENSIONS, ETC., FOR CLASSES A AND B

Size of Governor Diameter of Opening	1 1/4	1 1/2	2	2 1/4	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10
From cen. of inlet to base	3 1/4	3 1/2	4 1/4	4 1/2	5 1/4	5 1/2	6 1/4	7 1/4	7 1/2	8 1/4	8 1/2	9 1/4	10 1/4	11 1/4	11 1/2
Extreme Height	20 1/4	23 1/4	25 1/4	27 1/4	27 1/2	32 1/4	33 1/4	41 1/4	41 1/2	46 1/4	49 1/4	49 1/2	53 1/4	55 1/4	60 1/4
Extreme Expan. of Balls	7	8	8	9	9	10	10	13	13	15	16 1/2	16 1/2	18	20	20
Speed of Governor	350	380	380	300	300	340	340	320	320	275	275	275	260	260	225
Dia. of Pulley on Gov'r	2 1/2	3 1/2	3 1/2	4	4	4	4	5	5	5	6	7	7	8	8
Di. of Cyl 300 ft. P'n. Sp.	6	7	9	10	12	14	16	18	20	22	26	31	36	40	45
Di. of Cyl 400 ft. P'n. Sp.	5	6	8	9	10	12	14	16	18	20	23	27	31	35	39
Di. of Cyl 500 ft. P'n. Sp.	4 1/2	5	7	8	9	10	12	14	16	18	21	24	28	31	35
Di. of Cyl 600 ft. P'n. Sp.	4	4 1/2	6	7	8	9	11	13	15	16	19	22	25	28	32

For complete table and for sizes below 1 1/4—see our general catalogue.

We build to meet special conditions whenever practicable and are pleased to submit suggestions on request



Pickering is standard for specifications in Steam practice the world over.

We offer our services with over fifty years' successful experience.

DETROIT LUBRICATOR COMPANY

DETROIT, MICH.

Manufacturers of Lubricators, Force Feed Oilers, Oil and Grease Cups, Air and Gauge Cocks, Priming Cups, Water Gauges, Pop Safety Valve, Fusible Plugs, Radiator Valves, Water Relief Valves and Stewart Carburetors

DETROIT SIGHT FEED LUBRICATORS

Detroit Lubricators are made in a sufficient variety of styles and kinds to properly lubricate the valves and cylinders of all types of steam engines, steam pumps, gas engines, air compressors, etc. The complete line includes over 125 styles and sizes of lubricators—one for every kind of service.



Improved Standard Lubricator

IMPROVED STANDARD LUBRICATOR Double Connection

For use on all kinds of steam engines, steam pumps, etc.

Installed with both connections between the boiler and the throttle.

Finished in polished brass or nickel plated.

Size	$\frac{1}{4}$ Pt.	$\frac{1}{2}$ Pt.	1 Pt.	1 Qt.	$\frac{1}{2}$ Gal.	1 Gal.
Pipe Thread on Support Arm...	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$

DETROIT FORCE FEED OILERS

Detroit Force Feed Oilers are designed for the mechanical lubrication of gas and gasoline engines, air compressors, etc. The advantages of this system of lubrication are: cool, clean oil forced by mechanical pressure and in quantities as needed to the proper point to be lubricated, the elimination of the possibility of injury from running dry or carbon deposits, and very little attention from the operator as there is only one tank to fill.

They are made with 1 to 28 feeds and corresponding capacities of 3 to 17½ pints, using a standard tank, 4½" wide and 5" high. Special models for gas tractors, marine and stationary engines, automobiles, commercial trucks and aeronautical motors.



Four Feed Force Feed Oiler

DETROIT LOCOMOTIVE LUBRICATORS

Detroit Locomotive Lubricators are thoroughly suited to fulfill all the requirements of every style of locomotive from the saturated simple engine to the most modern superheated Mallet. The No. 22 Type of Bullseye Lubricator is recommended as possessing improvements and refinements made desirable by the needs of modern locomotive practice, resulting in a low cost of maintenance and economy in oil. Made with from one to eight feeds.



Three Feed Locomotive Lubricator

DETROIT RADIATOR VALVES

Detroit Radiator Valves embody in their design the results of years of experience in the manufacture of all kinds of valves for all styles of heating installation. The Detroit Packless Valve fulfills the need for a radiator valve that will not leak around the stem nor need repacking. Its construction makes it perfectly adapted also for use in vacuum systems where tightness is essential.



Packless Valve

GREENE, TWEED & CO.

109 DUANE ST., NEW YORK

Manufacturers of Rochester Automatic Lubricators, Palmetto and Manhatta Packings, Wrenches, Belt Fasteners, and Other Mill Supply Specialties

ROCHESTER AUTOMATIC LUBRICATORS

For Use on All Types of Steam Engines and Pumps and Air and Ammonia Compressors

In the new **POSITIVE CLUTCH DRIVE "ROCHESTER"** there are a number of new features which we wish to bring to the attention of all lubricating oil users.

Positive Clutch Drive: When we say "positive" we mean "positive," and this statement we are willing to back up by sending out lubricators on trial. Notwithstanding the fact that the drive is a clutch drive, there is a regulating device, whereby can be caused more or less lost motion of the actuating arm.

Noiseless: Then in the second place the new "drive" is noiseless, which fact recommends its use in many plants where quiet-running high-speed engines need just such noiseless lubricators.

Adapted for High Speed: This new "drive" is just the thing for high-speed engines, one operating at the present time on an engine running at 800 R. P. M. and another having been in operation for over a year on an engine running at 275 R. P. M.

Working Parts Encased: The principal working parts, while easily get-at-able, are encased and so protected from dirt, grit, etc.

Appearance: The appearance of this new type recommends itself to all users.

Automatic Gauge Glass Fixture: If the gauge glass breaks a valve in the lower fixture automatically shuts off the oil and the lubricator keeps on just as though nothing had happened.

SIZES: Made in all sizes from one-half pint to two gallons and with any number of feeds from one to eight. Also made with two compartments, for use where different kinds of oil are used in the different cylinders of the same machine, such as air compressors, ice machines, etc.

Finish—all sizes fully nickel-plated.

Working parts are made of steel, and all bearings are case hardened.

All the mechanism can be almost instantly detached and removed, giving easy access to the working parts for cleaning, repairing, etc., without disturbing the bowl or reservoir attached to the engine.

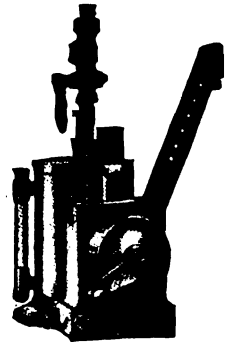
Equipped with Multiplus Sight Feeds, and vacuum and check valves.

Each feed is regulated independently.

Not affected by temperature, pressure, or vacuum.

Can be furnished in the regular ratchet-drive type, if desired.

No expense has been spared in the manufacture of Rochester Automatic Lubricators, efficiency and high quality being our aim rather than low prices.



McCORD MANUFACTURING CO.

DETROIT, MICHIGAN

NEW YORK OFFICE
165 Broadway

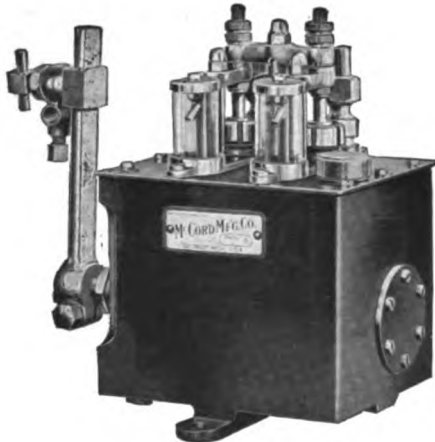
CHICAGO OFFICE
Peoples Gas Bldg.

Manufacturers of Force Feed Lubricators, Gaskets, Automobile Radiators

THE "McCORD" FORCE FEED LUBRICATOR

Is made in from 1 to 14 feeds and has a separate pump for each feed. Each pump has individual adjustment. It has constant sight feeds which show exactly how much oil is being pumped to each bearing and the flow can be adjusted from one drop to a full stream per stroke.

It is positive and automatic in action and operates in perfect synchronism with the engine or pump it is lubricating. It is not affected by viscosity of oil, variations in steam pressure or length of feed lines.



Class B—Two Feed

169

Note these standard features **and**
Positive sight feeds without pressure
Separate pumps capable of individual adjustment for each feed
Forced delivery of oil against pressure up to 1000 pounds, etc., etc.

These special features.
Heating Chamber
Auxiliary Hand Crank for accelerating feed
Sturdy operating lever
Reversible End Bearing
Plug for draining reservoir

There is positively no pressure in sight feed; all working parts are of the best drop-forged steel and operate in oil. Rotary or Ratchet drive. Finish—full Nickel Plate or Black Enamel and Brass. Straightaway Spring Check Valves. Heating Chamber and Auxiliary Hand Crank furnished as extras when specified.

ALL PRICES F. O. B. DETROIT

No.	Capacity	Feeds	List	No.	Capacity	Feeds	List
1	1 Quart	1 Feed	\$25.00	11	1 Gallon	5 Feed	\$57.00
2	1 Quart	2 Feed	30.00	12	1 Gallon	6 Feed	63.00
3	2 Quarts	1 Feed	28.00	13	1½ Gallons	7 Feed	75.00
4	2 Quarts	2 Feed	35.00	14	1½ Gallons	8 Feed	82.00
5	2 Quarts	3 Feed	42.00	15	1½ Gallons	9 Feed	90.00
6	2 Quarts	4 Feed	49.00	16	1½ Gallons	10 Feed	96.00
7	1 Gallon	1 Feed	33.00	17	2 Gallons	11 Feed	108.00
8	1 Gallon	2 Feed	39.00	18	2 Gallons	12 Feed	115.00
9	1 Gallon	3 Feed	45.00	19	2 Gallons	13 Feed	125.00
10	1 Gallon	4 Feed	51.00	20	2 Gallons	14 Feed	135.00

DOUBLE COMPARTMENT LUBRICATORS FOR AIR COMPRESSORS AND ICE MACHINES

21	2 Quarts	2 Feed	1 Feed in each	\$44.00
22	2 Quarts	3 Feed	2 & 1 Feed in each	50.00
23	2 Quarts	4 Feed	2 Feed in each	57.00
24	1 Gallon	2 Feed	1 Feed in each	47.00
25	1 Gallon	3 Feed	2 & 1 Feed in each	54.00
26	1 Gallon	4 Feed	2 Feed in each	60.00

For Heating Chamber add \$1.00 to list. For Auxiliary Crank add \$1.00 to list.

See Catalog "I" for Details

THE RICHARDSON-PHENIX CO.

126 RESERVOIR AVE., MILWAUKEE, WIS.

Lubrication Engineers and Manufacturers

WE MANUFACTURE

The Richardson Model "M" Sight Feed Oil Pump.

The Phenix Force Feed Lubricator.

The Peterson Power Plant Oil Filter.

Telescopic Cross-head Pin and Eccentric Oilers.

Central Oiling and Filtering Systems.

A Complete Line of Oiling System Accessories.



Richardson Individual Oiling and Filtering Systems.

Phenix Individual Oiling and Filtering Systems.

Union-Cinch Oil Pipe Fittings and Valves.

Gravity and Pressure Sight Feed Oilers.

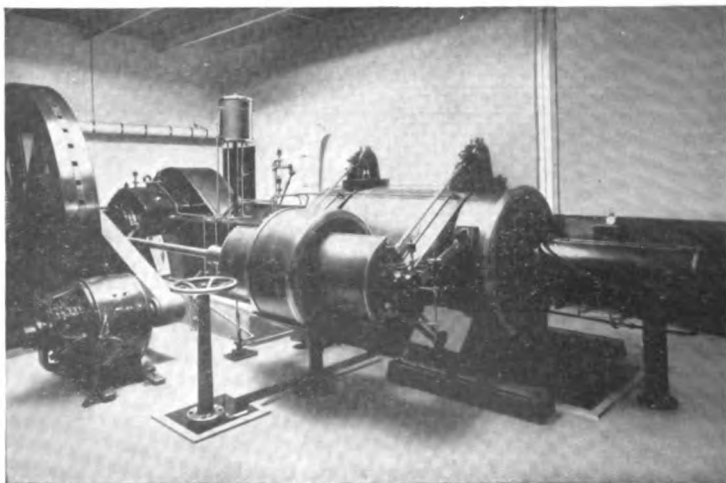
NOKUT Globe, Angle and Check Valves.

Write for our Books describing this apparatus

When purchasing a new engine or machine, simply insert in your specifications the following paragraph:

"Furnish and install complete and ready for operation, one Richardson-Phenix Individual Oiling and Filtering System, complete with Richardson-Phenix Force Feed Lubricators, Telescopic Oilers, Union Cinch Fittings and Sight Feed Oilers."

The machinery builder will relieve you of any further bother.



THE RICHARDSON-PHENIX CO.

126 RESERVOIR AVE., MILWAUKEE, WIS.

Lubrication Engineers and Manufacturers

THE PHENIX MODEL "T" LUBRICATOR

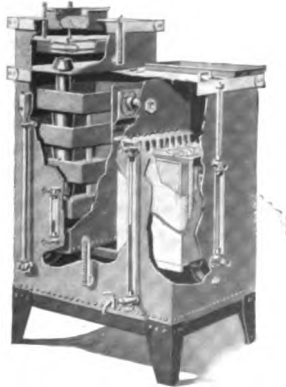
is especially suitable for the lubrication of high speed engines, power plant auxiliaries, steam hammers, dredges, traction engines, saw mill steam feeds, etc. Each feed is independently adjustable. It can be regulated and filled while in operation and delivers a definite quantity of any grade of oil against any pressure up to several thousand pounds. Can be furnished in sizes from 1 to 72 feeds. There are a number of superior points of the model "T" which are fully described in bulletin No. H 50-A.



1 Feed Phenix
Model "T" Lubricator

THE PETERSON POWER PLANT FILTER

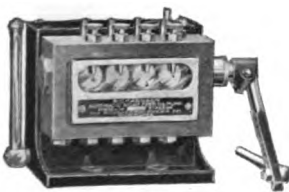
is built on the Multiple Filter Unit Principle. Each Unit can be separately removed and cleaned without stopping the operation of the filter. Capacities 100-50,000 gallons per hour.



No. 5 Peterson Power Plant Filter

This filter is equipped with an Automatic Water Overflow which ejects all water precipitated from the oil, out of the system automatically. Designed for Power Plant, Cutting Oil, and Hydro-Electric Installations. Described in Bulletin H-10.

171



4 Feed Richardson
Model "M" Lubricator

THE RICHARDSON MODEL "M" LUBRICATOR

operates on a new principle in that it supplies oil for cylinder lubrication in small particles for every stroke of the engine piston. The result is better lubrication with reduced oil consumption. Built in sizes from 1 to 22 feeds. It is especially suitable for use on gas, oil, and Diesel engines. Fully described in Bulletin No. H 60.

MADISON-KIPP LUBRICATOR CO.

Established in 1898

MADISON, WIS.

Manufacturers of Valveless Force Feed Mechanical Lubricators

Madison Kipp Lubricators

STANDARD EQUIPMENT FOR COMPRESSORS, STEAM
ENGINES, OIL ENGINES, AND
SHOP MACHINERY



MODEL 50 SIGHT FEED TYPE

Built in any number of feeds

During the past few years popular demand has made the force feed system of lubrication standard for power installations.

Madison-Kipp Lubricators are built in any number of feeds to meet this demand. They have no ball and spring valves in their pumping mechanism. They are positive in delivering oil against pressures up to 2,000 pounds per square inch. All moving parts are inside the tank operating constantly in oil.

All good features are standard. Every unit has sight feed and individual adjustment. Each lubricator has an auxiliary hand crank.

Data on standard Model 50 Lubricators—Ratchet or Belt Drive

	Capacity	Over All Length	Height	Width
One Feed	5 Pints	11 ¹ / ₄ "	8"	4 ¹ / ₂ "
Two Feed	5 ¹ / ₂ "	12 ¹ / ₄ "	"	"
Three Feed	5 ³ / ₄ "	13 ¹ / ₄ "	"	"
Four Feed	6 "	14 ¹ / ₄ "	"	"
Five Feed	6 ¹ / ₂ "	15 ¹ / ₄ "	"	"
Six Feed	7 "	16 ¹ / ₄ "	"	"

Data on special lubricators and larger sizes furnished on request.

ALBANY LUBRICATING CO.

ADAM COOK'S SONS, PROPS.

708-10 WASHINGTON ST., NEW YORK

Manufacturers of Lubricating Oils and Greases

ALBANY GREASE

Is a pure lubricant so compounded that it automatically maintains a film of oil between rubbing surfaces, reducing friction losses to a minimum. It contains no adulterants and is guaranteed not to oxidize, gum or corrode the metal of the bearings. Made in different consistencies to meet different temperature conditions.

You must consider two things when lubricating machinery of any kind. First—Is the lubricant efficient? Does it give perfect satisfaction at all times or only part of the time? Second—Is the lubricant economical? Does it do its work at the lowest possible cost or is it wasteful?

Albany Grease is efficient and economical at all times. It is efficient because it will lubricate any kind of machinery and line shafting perfectly.

It can be used in any kind or style of grease cup and will not gum, cake or clog. It will not corrode, neither will it turn a reddish color, showing that it contains no acids. Albany Grease will remain a golden yellow to the end.

It is economical because it stays where you put it and does not run or leak away. When the machine is not in operation, Albany Grease does not flow. It will flow just enough to give perfect lubrication—no more. These are facts that you should bear in mind when buying a lubricant.

Albany Grease will show wonderful results on Line Shafting and Loose Pulleys, also on Steam, Gas, Gasoline or Oil Engine Main Shaft Bearings, Crank Pins, Eccentrics and Slides. On special machinery, such as Printing Presses, Shoe Machinery, Coal and Metal Mine Equipment, Sugar Machinery, Cotton, Woolen and Paper Mill Installations, Lumber Camp Machinery, Wood Turning, Sawing Machines and in Steel Mills, it gives the best of service. In fact, no matter what kind of machinery you have, Albany Grease will lubricate it so that it will operate perfectly, keeping it cool and easy running, and reducing depreciation to the minimum.

Albany Grease is made in seven different consistencies to meet various conditions and temperatures. Use the right consistency for your work and you will have absolutely no trouble.

SOFT NUMBERS (Nos. 0 and 1) for slow running, heavy machinery or where equipment is operated outdoors or low temperature has to be contended with.

MEDIUM NUMBERS (Nos. 2 and 3) for general machinery and shafting; the former is known as a winter grease and the latter as a summer grease. These are the most generally used consistencies.

HARD NUMBERS (Nos. X, XX, XXX) for use in places where the Soft and Medium numbers are not adaptable, especially where the temperature surrounding the bearings is high. The No. XXX has the highest melting point with a great lubricating value.

Due to the wide publicity given Albany Grease, unscrupulous concerns occasionally substitute inferior goods for our product. When purchasing Albany Grease, insist that our trade mark appears on the package.

We also refine and manufacture, in addition to Albany Grease, lubricating oils and greases to meet all requirements. No matter what your lubricating proposition may be, we can supply your entire wants. We will be glad to send complete data covering the entire lubrication of your equipment and place at your disposal expert engineering service.



TRADE MARK
Reg. U. S. Pat. Office

SWAN AND FINCH COMPANY

NEW YORK

PHILADELPHIA

PROVIDENCE

CHICAGO

HARTFORD

SAN FRANCISCO

Manufacturers of Lubricating Oils and Greases

These Lubricants are the result of sixty-five years' experience and a careful study of conditions to be met. They are designed to answer every ordinary requirement.

Where unusual conditions are confronted or problems arise, we shall be glad to give you the benefit of the experience and knowledge of the Lubrication experts of our Engineering Service and recommend an oil or grease exactly meeting the situation.

S-F SPECIALTIES

Slo-Flo—The super-lubricant. Will not drip, climb nor spatter—withstands excessive heat and pressure.

Cupese—A quality cup grease for all machinery requirements.

Motul—A quality motor oil for automobiles, trucks and tractors.

Gearese—A correct transmission and differential lubricant for motor cars and trucks.

Aerul—A practical high quality oil for aero-plane motors.

Corul—A liquid binder that meets the 11 requirements of perfect core casting for malleable and gray iron castings.

Textul—An economical, high quality oil compound for wool and worsted manufacture.

Talese—An economical practical drop forge die-swabbing grease.

Marinul—A world-known special oil, produced to meet the excessive stresses of marine service.

Larcul—A practical, economical metal-cutting lubricant.

Exese—The 600° F. lubricant—for oven gears—bloom cars—calendar rolls—automatic stokers or lubrication under excessive heat conditions anywhere.

Vesuvese—A waterproof lubricant for exposed gears—for cable dressing.



STANDARD ATLAS LUBRICANTS

Atlas Slow Speed Engine Oils
Atlas High-Speed Engine Oils
Atlas Steam Cylinder Oils
Atlas Turbine Oil
Atlas Engine Oil
Atlas Dynamo & Motor Oils
Atlas Compressor Oil
Atlas Gas Engine Oil

Atlas Crank-Case Oil
Atlas Transformer Oil
Atlas Cutting Oils
Atlas Tempering Oils
Atlas Quenching Oils
Atlas Spindle & Loom Oils
Atlas Wool Oils
Atlas Leather Oils & Greases



THE TEXAS COMPANY

Petroleum and Its Products

HOUSTON

NEW YORK

BOSTON
ATLANTA
NORFOLK
PHILADELPHIA

DALLAS
YOUNGSTOWN
BIRMINGHAM

BRANCH OFFICES

EL PASO
CHICAGO
OKLAHOMA CITY

ST. LOUIS
NEW ORLEANS
DENVER

TEXACO LUBRICANTS

In your plant TEXACO LUBRICANTS and TEXACO SERVICE will show the utmost efficiency and economy on engines, dynamos, and machines of all kinds.

The TEXACO Line includes in part:

TEXACO ZENITH VALVE OIL and other cylinder oils, for various steam engine conditions.

TEXACO URSA OIL for the complete lubrication of Diesel Engines, and other heavy oil engines.

TEXACO CETUS OIL, a recognized lubricant for steam turbines.

TEXACO NABOB OIL, TEXACO ALEPH OIL, and TEXACO ALTAIR OIL, three very fine general machine oils for light, medium and heavy machines.

TEXACO CANOPUS OIL and TEXACO REGAL OIL, for dynamos and high speed engines and machines.

TEXACO RABTEX SPINDLE OIL and a complete line of oils for the textile trade.

TEXACO CUTTING OILS.

TEXACO GREASES for all purposes.

TEXACO ICE MACHINE LUBRICANTS.

TEXACO CRATER COMPOUND

The crying need for an efficient gear lubricant has been felt in many industries for a long time, but this need had never been adequately met before the advent of TEXACO CRATER COMPOUND.

The properties of "CRATER" may be summed up as follows:

1. It adheres to metal surfaces.
2. It is absolutely impervious to mine waters or other chemicals.
3. It is always a lubricant, always oily to the touch.
4. It is pure, homogeneous—as nothing is added to it during manufacture, nothing can separate out in use to destroy its body or to cause it to dry up or flake off.

TEXACO MOTOR LUBRICANTS, including Texaco Motor Oil, Texaco Grease, and Texaco Transmission Lubricant, all well known for their high excellence.

TEXACO RAILROAD OILS.

A full line of all the best oils for steam and electric railways, and for all marine purposes.



We shall be glad, at all times, to take up any question relating to the use or application of lubricants. Address inquiries to The Texas Company, Department M. E., 17 Battery Place, New York City.



TIDE WATER OIL COMPANY

11 BROADWAY, NEW YORK

Manufacturers of Petroleum Derivatives

150 PRODUCTS FROM ONE SOURCE

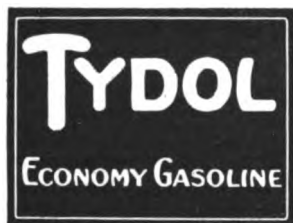
More than 150 different petroleum products are manufactured in the great refinery of the Tide Water Oil Company in Bayonne, N. J.

The broad scope of Tide Water activity is indicated by the wide diversity of these products. They range

in many special grades for every purpose and for every type of internal combustion motor and for every use, from the smallest motor-cycle engine to the power plant of the largest motor truck.



The Tide Water trademark has a recognized value all over the world.



Orange and black metal flange sign displayed by Tydol dealers

from lubricating oil for airplane engines to pure white paraffine wax; and from gasoline so volatile that it boils in a test tube from the heat of the hand to pitch so heavy that it will not flow from its containers.

Exact scientific formulae, based on definitely recorded knowledge, guide every operation in the Tide Water plant. No "rule of thumb" methods are tolerated.

The consistently progressive policy maintained throughout the company's forty years of experience in oil refining insures the uniform quality, economy and efficiency of Tide Water products.

Veedol Oils and Greases—Their famous heat-resisting quality has created a large and widespread demand for Veedol oils and greases for automobile lubrication. They are made

Tydol Gasoline—Fast vaporization and maximum power are characteristic of Tydol, which has become famous as "the economy gasoline." It burns up cleanly, keeping the cylinders, valves and manifolds free from carbon.

Kerosene—The unusual quality of the three Tide Water brands—Snowflake, water-white, 150°; Chester, standard white, 130°; and Stella, standard white, 110°—has won a wide market for them in every part of the globe.

Other Tide Water Products—These include cylinder oils; engine oils; turbine oils; machine oils; marine oils; white oils; miscellaneous greases; petroleum; gas and fuel oils; paraffine wax; petroleum coke; pitch, etc.



The Veedol can is of a distinctive design that is both striking and attractive. It is black with orange lettering, making a strong display.

AKRON METALLIC GASKET CO.

152 N. UNION ST., AKRON, OHIO

Manufacturers of Corrugated Copper Gaskets; Copper Asbestos Gaskets; Akro-Metal Corrugated Gaskets for Superheated Steam; Special Gaskets any Shape or Size of Copper, Lead, Steel, Tin, Aluminum, Monel Metal, Brass, Etc.

Gaskets cut from Akronite Sheet Packing

FULL FACED
gaskets punched with
Bolt Holes



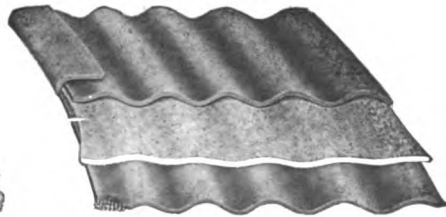
Ring Type Gasket Fit Inside Bolts

Gaskets and washers
 $\frac{1}{4}$ inch to 10 ft.

"Akro-Metal" Corrugated Gaskets guaranteed for 5 years on Highest Superheated Steam.



Cross Section
Akron Copper Asbestos Ribbed Gasket



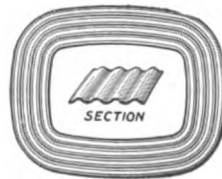
Cross Section
Summit Copper Asbestos Filled Gasket

177



Asbestos Filled

**WE SHIP QUICK
AND
APPRECIATE YOUR
BUSINESS**



Corrugated
Special Shaped Gasket

When in need of gaskets for any purpose let us quote.

Send for our complete catalogue.

CRANE PACKING COMPANY

9 S. CLINTON ST., CHICAGO, ILL.

Manufacturers of "John Crane" Flexible Metallic Packings

NEW YORK CITY
787 Park Row Bldg.

PHILADELPHIA
1067 Colonial Trust Bldg.

PITTSBURGH
708 May Bldg.

Factory U. S. A.: Chicago.

Canadian Factory: Windsor, Can.

"JOHN CRANE" FLEXIBLE METALLIC PACKING

STEAM
AIR
AMMONIA
WATER
OILS
DISTILLATES
ACIDS, ETC.



PLUNGERS
VALVE STEMS
CONDENSER TUBES
TURBINES
CENTRIFUGAL PUMPS
HYDRAULIC MACHINERY ETC.

"John Crane" Ring Form

1—SERVICE: Packing steam, air, water, oil, ammonia, gas, any vapor or liquid right from same coil. Think of it.

2—STOCK: A coil of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ absolutely protects you against shut-down. Any coil can be formed $\frac{1}{16}$ smaller or larger with ease.

3—TEMPERATURE: Heat kills fabric packing, but has no effect on metal. Hence "John Crane" permanency.

4—PRESSURE: These flat metal sheets are ideal barriers for pressures. Resists up to 5000 pounds.

5—FLEXIBLE: All metallic, yet bends easily, taking any form or shape under pressure.

6—EASILY INSTALLED: No complicated directions. Just cut with knife and install like any fabric packing and in same stuffing box.

7—MINIMUM FRICTION: Any Engineer knows that Babbitt metal absorbs little power when rubbed against lubricated and polished steel. Well, this packing is made of babbitt metal.

8—MINIMUM WEAR: Where there is little friction, there is little wear. Six years' constant service is not unusual with "John Crane" still polishing.

9—SPIRAL CONSTRUCTION: Thin sheets of babbitt bound round spirally form perfect barriers to vapors and liquids.

10—LUBRICATING RESERVOIRS: Ideal reservoirs of lubrication are formed by spiraled layers, which when filled with oil, grease or graphite, automatically ooze out under pressure of gland.

11—NO HARDENING: No amalgamation of these ribbons of babbitt possible when separated by reservoirs of lubrication. Hence no hardening and always further compression. It is good business to use a packing that is always compressible.

12—NO SCORING: It is a well-known fact that a good, well-babbitted bearing will never score a shaft, neither will a good Babbitt packing—in other words, "John Crane" packing.

13—PERMANENCY: Five years on outside packed plungers, accumulators, presses, rods, shafts and stems justifies its general adoption.

14—EASILY ORDERED: If you want to pack, you do not want to order THIS KIND FOR THIS KIND OF SERVICE and THAT KIND FOR THAT KIND OF SERVICE. All you need to do is to order "John Crane" for everything.

15—OUR OFFER: If you have never tried "John Crane," speak now. We will send on approval as much packing as you need to make a fair trial entirely at OUR risk. Give us a good plunger, its diameter, size of stuffing box and depth, and it's yours on approval.

16—100% EFFICIENCY: "John Crane" is used right down to the last layer of metal and the last layer of lubricant. Its compressibility is unlimited.

17—WHERE TO USE: Especially adapted to hand valves, header valves, expansion joints, traps, Corliss valve stems, piston rods, throttle valves, centrifugal pumps, high pressure hydraulic pumps, presses, accumulators, plunger pumps, condenser tubes, evaporator tubes, etc.



$\frac{1}{8}$ " "John Crane" Coil Form

Put your packing troubles up to us. "John Crane" Flexible Metallic Packing is not only DIFFERENT, but FAR BETTER. Get our Bulletin No. 1 for special services.

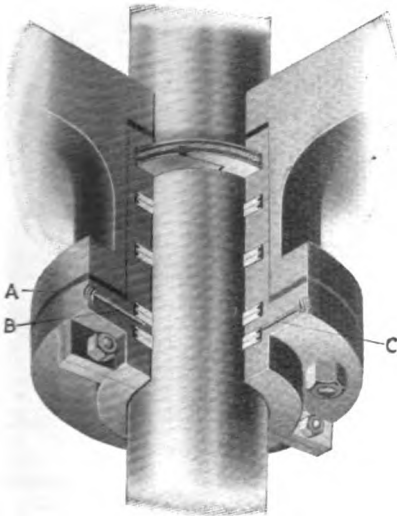
FRANCE PACKING COMPANY

TACONY, PHILA., PA.

Branch Offices in All Principal Cities

METALLIC PACKING FOR ALL CONDITIONS OF SERVICE

Steam, Gas, Air and Ammonia

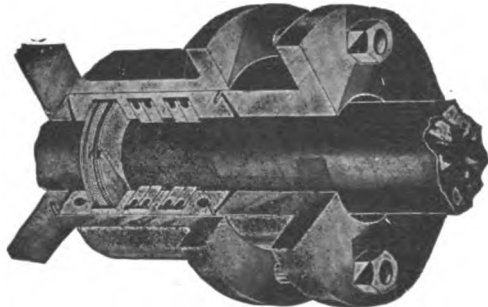


Marine Type Packing, Split Case

This type of packing is used extensively on vertical and marine engines. It is tapped for carrying off the water that may adhere to the rod, also for lubrication when desired.

179

A very satisfactory packing where the stuffing box will take $\frac{5}{8}$ inch packing or larger and where the stuffing box is $3\frac{1}{2}$ " deep or deeper. Outside types furnished where the stuffing box will not admit of this type.



Inside Split Case Packing

GOETZE GASKET AND PACKING CO.

22 ALLEN AVE.

NEW BRUNSWICK, N. J.

Metal Gaskets of Various Types. Metallic Engine Packing. Sheet Packing for Flanges. Valve Gaskets or Discs

GOETZE NO. 2 ELASTIC GASKET

A Copper-Asbestos Gasket—the copper is corrugated and the closely twisted asbestos is held in the corrugation as shown in the cut at the right.

One of Goetze No. 2 Gaskets will make a tight joint where several of other kinds fail to hold. It is recommended for high pressures, high temperatures and the most exacting service generally.

When used for flanges, it makes a joint practically as leak-proof as the pipe itself, even with the roughest, most uneven surfaces.

Guaranteed for five years and sent on 90 days' trial.



GOETZERIT GASKETS

$\frac{1}{8}$ Inch Thick



In Sheets about 50 inches square, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$ inch thick. Weight, about $5\frac{1}{2}$ ounces per square foot $\frac{1}{8}$ inch thick.

\$1.00 per pound.

We have perfected in our "Goetzerit," a sheet packing which is easily the best of its kind.

"Goetzerit" is made from pure, prime asbestos fiber, compressed under an exceedingly high pressure. It is impregnated with a substance which makes it absolutely proof against the action of high pressure superheated and saturated steam, ammonia, air, acids.

GOETZE'S VALVE GASKETS OR DISCS

These are intended for valves of the Jenkins type and are made of copper and asbestos. The illustration shows a plan and section and it will be noticed that the hole has two flat sides as is common in most makes of valve discs. They are made in the following sizes; $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, 6, 7, 8, 9, 10 and 12 inches.

It's the best because it lasts the longest.



THE UNITED STATES METALLIC PACKING CO.

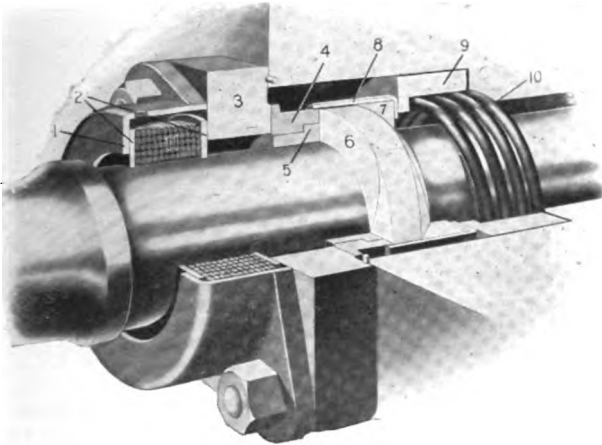
FACTORY
429 N. 13TH ST.

PHILADELPHIA, PA.

GENERAL OFFICES
221 N. 13TH ST.

BRANCH OFFICES: NEW YORK AND CHICAGO

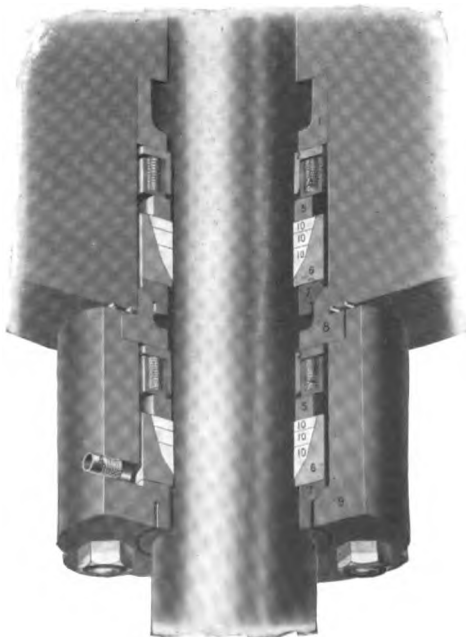
**Manufacturers of Metallic Packings for Locomotive, Marine and Stationary
Engine Piston Rods and Valve Stems; also other Locomotive Appliances**



King Piston Rod Packing

KING PACKING for locomotive piston rods, valve stems and air pumps has demonstrated its simplicity, efficiency and economy on a majority of the locomotives in the country. Designed and manufactured in a manner to meet the extreme requirements of modern railway service.

CLASS NO. 1 PACKING used in a majority of cases by us for packing marine and stationary engines. We manufacture other designs of metallic packings for marine and stationary service, varying the design to suit the requirements.



Class No. 1 Packing

JAMES WALKER & CO., LTD.

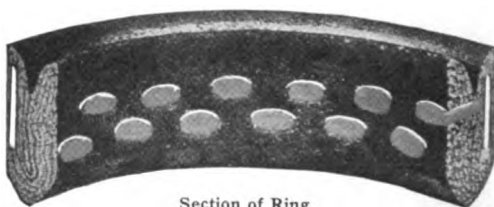
27 THAMES ST., NEW YORK

Manufacturers of Lion Steam and Hydraulic Packings and Every Description of Packings and Mechanical Rubber Goods

AGENTS: J. & R. Wilson, Inc., San Francisco, Calif., Sole Western Agents. Economic Engineering and Supply Co., 47 Clinton Ave., N., Rochester, N. Y. O. C. Keckley, Chicago, Ill. J. & R. Wilson, Inc., Norfolk and Newport News, Va.

"LION" (Patent) EXPANDING METALLIC STEAM PACKING

This Packing is undoubtedly the Ideal Packing for High-pressure Steam Work and high-speed engines. As will be seen from the illustration, the packing is made with a channel or groove, and with a corresponding tail, so that each successive turn fits into one another. The packing is automatic in its action, the pressure finding its way into the channel or groove, causing it to expand.



Section of Ring

In work where the rods are worn or not running true, it is the only packing that will keep a perfectly tight gland.

It is made of the finest materials, and by its construction is rendered automatic. As will also be observed, the packing has a metallic wearing face (metal studs) which not only adds to the life of the packing, but at the same time prevents scoring in any way.

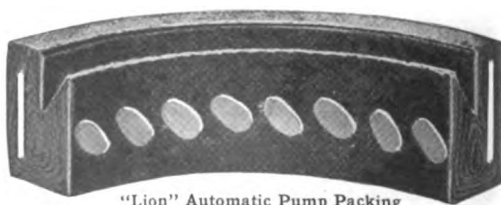
We can with confidence recommend it for every description of steam work.

■ Made in 10- or 12-ft. lengths, all sizes, from $\frac{1}{4}$ in. upwards, spiral form.



"LION" (Patent) AUTOMATIC METALLIC PUMP PACKING

The "Lion" (Patent) Automatic Packing is, without exception, the finest Packing in the market for Hydraulic and Pump-work generally. *Acts like a ram leather*, and by the introduction of metal studs to form a metallic wearing face, friction is absolutely reduced to a minimum. *The pressure acts upon the lip of the packing.*



"Lion" Automatic Pump Packing

For your protection, there's a thin red line running through Genuine "Lion" Packing. Be sure to look for it. *Catalog on request.*

THE B. F. GOODRICH RUBBER CO.

AKRON, OHIO

Representation Everywhere

HOSE

WATER HOSE covers a wide range of usage.

"White Anchor," **Commander**—special grades for unusual conditions of service.

"Triton," "Cascade," "Deluge"—regular grades for all general purposes.

"Akron," "Jupiter"—braided fabric water hose—in any length up to 500 feet. STEAM HOSE, heavily constructed to stand pressure, and inner lining compounded as to resist action of steam under varying temperatures.

"Goodrich"—for high pressure. This is truly a long-life hose.

Special coverings for steam hose: Red Painted Woven Cotton, Marlin Wound, Marlin Woven, Asbestos Wire-Wrapped Cover, or Wire Wrapped.

PNEUMATIC HOSE, wrapped duck—50-foot length style:

"Goodrich"—the highest quality for the hardest service.

"Akron"—the standard hose for all general purposes.

Braided Pneumatic Hose—any length up to 500 feet. "**Commander**," "**Mainstay**" and "**Maxecon**" brands.

AIR DRILL HOSE, wrapped duck type, is heavily constructed throughout with a layer of canvas on the outside as a protection against cuts and abrasions.

"Quarry"—our standard grade.

"Goodrich"—braided construction—special wear-resisting cover. Designed to meet the extreme in unusually severe service.

BOILER WASHOUT HOSE, made in extra heavy weight for rough service. Use our heavy "Boiler Washout Hose" for turbine tube cleaner work. "**Goodrich**," "**Akron**" and "**Commander**."

SUCTION HOSE is made in a variety of grades to suit any purpose, either smooth or rough bore style.

FIRE HOSE—"White King," "Chieftain," "Alarm," "Signal," "Planet" "**Meteor**" and "**Solan**" Mill Hose. A wide spread in qualities, offering a corresponding difference in price. "**White King**" is especially recommended for municipal service.

DREDGING SLEEVES, OIL SUCTION HOSE, OIL WELL DRILLERS' HOSE, OIL CONDUCTING HOSE, GASOLINE HOSE, SAND BLAST HOSE, COKE HOSE, DECK HOSE, AUTOMOBILE RADIATOR HOSE, Etc., all especially adapted to the purposes for which they are made.

PACKING

RED SHEET PACKING—an excellent product, in two grades.

RED SHEET BRASS WIRE INSERTED in the same grades.

DIAPHRAGM AND CLOTH INSERTION.

SUPERHEAT PACKING, a combination of rubber and asbestos, especially adapted for high pressures.

RED TUBULAR GASKET PACKING, SPIRAL SQUARE DUCK PACKING, ROUND AND SQUARE DUCK PACKING, SQUARE RUBBER BACK ROUND PISTON PACKING, AND PURE GUM STRIPS.

RUBBER GASKETS

All grades and shapes. No matter what your requirements may be, we can supply them.

TUBING

Any size and grade for any known service. Plain and cloth inserted. Braided cover.

"GOODRICH" RUBBER PUMP VALVES

Our list of grades is complete; we give special attention to unusual conditions. Made in grey or red rubber.

MOLDED RUBBER GOODS

We make Molded Rubber articles of every description—Diaphragms, Bumpers, Springs, Cushions, Tips, Balls, Billiard Cushions, Respirators, Rubber Mallets, Soles and Heels, Parts for Automobiles, Truck Wheel Tires, Discs for Steam and Radiator Valves, Special Articles used in connection with the Oil Industry, Sugar Factories, Creameries, Breweries, Laundries, Rubber Parts for Plumbing Devices, Carpet Sweepers, Vacuum Cleaners, etc.

THE AMERICAN METAL HOSE CO.

WATERBURY, CONN.

Manufacturers of Flexible Metal Hose and Tubing



Section B. D. 15 Bronze
Steam Hose Showing
Interlocking Joints

AMERICAN METAL HOSE is just what the name implies—a Hose made of metal.

We manufacture Flexible Metal Hose for all the purposes for which rubber hose is used. Its strength and lasting qualities make it the most efficient and economical hose on the market.

While rubber hose gives fairly good results when used in certain easy services such as carrying air and water, in the more severe duties it is unsatisfactory and expensive on account of the frequent replacements necessary. Rubber is a vegetable compound which rapidly deteriorates under the action of Oils, Alkalis and the intense heat of Steam; consequently no hose with rubber in its composition will last any length of time when used to convey any of these agents.

American Metal Hose is made from a continuous strip of high tensile strength Phosphor Bronze or well-galvanized Steel, the edges of which are turned in during the process of manufacture to make the "Interlocking" joints shown in the accompanying illustration. It has the strength of metal combined with great flexibility, and is in no way affected by the heat of Steam or the chemical action of Oils. In addition to the above advantages Metal Hose will successfully withstand very high pressures. We can supply special Metal Hose for pressures up to 6000 lbs. per square inch.

American Metal Hose of the "Interlocking" construction is, from its very nature, a high pressure hose, and is our standard for conveying Steam and Oils. In addition to this Hose, we are making several other types for carrying Air, Water, Gas, etc., and for Vacuum.

Its permanent nature makes American Metal Hose an admirable substitute for swing or telescoping joints and rigid piping on machines where a flexible connection is desired for conveying Steam or Oil. It is particularly adapted to use on presses where a constant supply of Steam must be fed to the moving parts.

We are prepared to furnish Couplings of any description with our Hose. Prices and full particulars on application.



Government Inspector Testing American Metal Hose for the U. S. Navy Department

**CATALOGUE SECTION
PART II**

**Power Transmission Machinery
Elevating and Conveying Machinery
Hoisting and Transporting
Machinery**

185

Pages 187-282

THE A. & F. BROWN CO.

Established 1854

Incorporated 1898

79 BARCLAY STREET,
NEW YORK CITY

WORKS:
ELIZABETHPORT, N. J.

Engineers, Founders, Machinists and Millwrights. Manufacturers of Gears of all Descriptions, Turned Steel Shafting, Pulleys, Split Pulleys, Friction Clutches, Special Machinery, Etc.

CUT GEARS

These gears are cut on the best up-to-date automatic machines obtainable, enabling this department of the shops to turn out accurately cut gears of every description and size.

MACHINE MOULDED GEARS

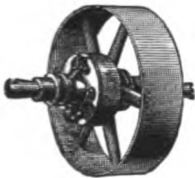
The Gear Department of our foundry is fitted up with the most modern gear moulding machines, enabling us to furnish machine moulded gears up to 16 feet diameter, and 25 tons in weight if in one piece, and heavier if split, or built up. These gears are much more accurate than ordinary cast gears and are of the toughest mixture of iron.



187

FRICTION CLUTCHES

The F. Brown Friction Clutch is simple, compact and having few small parts is not liable to get out of order; engages gradually and when thrown "in gear" has a stronger grip than any other, owing to the large friction surfaces and powerful operating device which is a combination of double-ended (or right and left thread) screw and toggle joint.



SIRENS

These fog signals are used by the United States Navy and Lighthouse Departments, also by a number of foreign governments and many steamships. They are also in use as fire alarm signals in small towns and large manufacturing plants.

COGSWELL MILL

The problem of grinding or pulverizing many materials has been successfully solved by this machine.

SPECIAL MACHINERY

These shops are particularly well equipped for building special machinery to plans and specifications. The pattern shop, foundry and machine shops are strictly up to date in all particulars and equally well equipped to turn out work of the heaviest character as well as light machinery requiring first class material and workmanship and most modern tools.



THE FALK COMPANY

MILWAUKEE, WISCONSIN

Manufacturers of Precision Herringbone Gears with Staggered Teeth (Wuest Patents)

WUEST HERRINGBONE GEARS

We manufacture a complete interchangeable system of herringbone gears, with teeth generated on special machines, designed and built exclusively for our own use.



A Large Set of Wuest Gears for an Aluminum Mill

Fig. 1

SPECIAL ADVANTAGES

Long life.

High efficiency (loss never exceeds 1% at rated load).

Elimination of countershafts and double-gear trains.

Absence of vibration with prevention of shaft crystallization and breakdown of motor insulation.

Quiet action with durable steel pinions.

The gears which we produce are hobbled, both sides at once, in solid blanks.

The Wuest System of staggered teeth, besides giving the maximum contact surface for a given width of face, is invaluable in securing unbroken continuity of engagement when using high ratio pinions with very few teeth.

Other distinctive features:—

Highest attainable accuracy.

Involute tooth form on *circumferential* section.

Invariable spiral angle. Perfect interchangeability.

Equal efficiency in both directions.

SIZES

We manufacture hobbled herringbone gears in the following sizes:

Any pitch, from 10 D. P. to $\frac{3}{4}$ D. P.

Any face, from $1\frac{1}{4}$ inches to 72 inches.

Any diameter, from 2 inches to 16 feet.

True spiral gears of constant angle cut to standard diametral pitch like spur gears.

Referring to illustrations, Fig. 1 shows a large set of Wuest gears for an aluminum mill. Fig. 2 shows a high ratio double reduction gear unit for 3000 H. P. marine turbine drive—U. S. Shipping Board. Fig. 3 is a standard type of herringbone gear unit for motor-driven rolling mills.

THE FALK COMPANY

WUEST HERRINGBONE GEARS

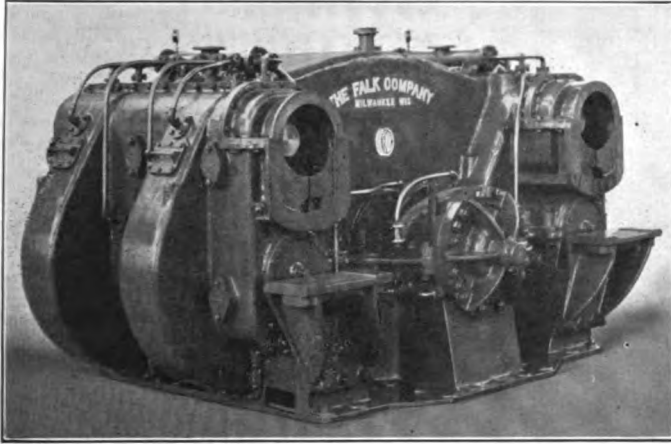


Fig. 2

WUEST HERRINGBONE GEARS transmit power by smooth, continuous action without jar, shock or vibration.

They are almost noiseless.

They can be used for extremely high *single* gear ratios. In this connection we make a specialty of forged pinions in one piece with their shafts. Ratios of 15 to 1 are quite normal and 20 to 1 may be used when necessary. Wuest gears can be run with safety at far higher velocities than the spur type. Special gears for use in connection with steam turbines are suitable for speeds up to 10,000 feet per minute.

The range of application for Wuest herringbone gears covers every case where spur gears are used and many new fields where spur gears are impossible.

Specially adapted for

Marine Steam Turbines.
Turbo-Generators.
Turbine-Driven Centrifugal Pumps, Mills and Shafting.
Rolling Mills and Rod Mills.
Tube Mills and Crushing Plant.
Power Pumps.
Air Compressors and Blowers.
Hoisting, Elevating and Conveying Plant.
Rubber Machinery.
Machine Tools.

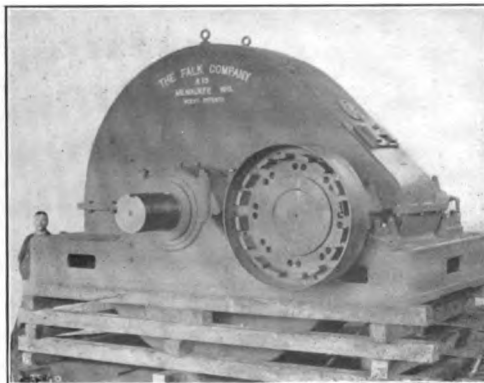


Fig. 3

FAWCUS MACHINE COMPANY

PITTSBURGH, PA.

OFFICE
First National Bank Bldg.

WORKS
Pittsburgh & Ford City, Pa.

Cut Gears and Special Machinery

PRODUCTS

Cut Herringbone Gears

2 inches to 20 feet diameter (see our data on opposite page).

Cut Spur Gears

2 inches to 20 feet diameter.

Cut Bevel Gears

2 inches to 48 inches diameter.

Cut Worm Gears

2 inches to 10 feet diameter.

Enclosed Worm Gears

5 H. P. to 25 H. P.

Flexible Couplings

For shafts 1" to 20" diameter.

Special Machinery

"Built to your order."

Standard Enclosed Herringbone Gear Drives

25 H. P. to 1500 H. P. (Herringbone Gear Booklet on request).

Special Enclosed Gear Drives

25 H. P. to 6000 H. P.

Turbine Reduction Gears

25 H. P. to 3000 H. P.

OUR SPECIALTY

Is making cut gears to your order. Give us your problem or send specifications. We design complete transmissions. Our shop facilities are such that we can handle orders rapidly. We invite inquiries on any kind or size of gear. The services of our engineers are at your disposal if needed.

USES

For general use wherever power is transmitted, as for pumps, hoists, cranes, machine tools, presses—in fact for all motor, engine or turbine driven machinery.

WORKMANSHIP

There is a vast difference between cut gears and *correctly cut* gears. This difference means less noise, less wear, less friction, less power wasted, less fuel consumed—time and money saved.

Rapidity of cutting is of less importance with us than *accuracy* of cutting.

MATERIAL

Strength and wearing qualities are essential in gearing.

We use furnace annealed acid Open Hearth Steel Castings, Basic Open Hearth Hammered Steel Forgings, "Steel Mixed" close grain Iron Castings, and Standard Analysis Phosphor Bronze and Brass Castings.

SERVICE

For rapid production of orders, we have over ten thousand well designed gear patterns of all types and sizes. In almost every case one of these is found suitable for the gear you require, and will be used without charge except when a small change in size is necessary.

FOR EVERY
SIZE
OR
STYLE
OF
CUT GEAR



FAWCUS
CORRECTLY
CUT
GEARING

All Made to Your Order Promptly and Accurately

FAWCUS MACHINE COMPANY

PITTSBURGH, PA.

OFFICE
First National Bank Bldg.

WORKS
Pittsburgh and Ford City, Pa.

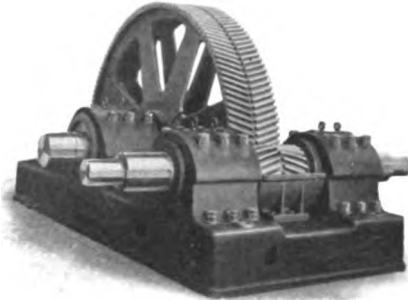
Cut Gears and Special Machinery

FAWCUS HERRINGBONE GEARS

The purpose of Fawcus herringbone gears is to transmit power more quietly and more efficiently than is possible with spur gears. Gear and pinion teeth are cut in solid blanks on Fawcus patented hobbing and planing machines.

Opposite halves of each tooth are machined simultaneously, thereby obtaining maximum accuracy of tooth form, spacing and alignment.

Correct construction demands that the two halves of each tooth be set opposite, the apex of the angle being in the center of the gear face. Face width must be so proportioned that teeth will have overlapping or continuous action, the minimum face width being about six times the circular pitch of the teeth for a standard helix angle of 23° . All teeth are cut to diametral pitch standards, twenty degrees involute short addendum.

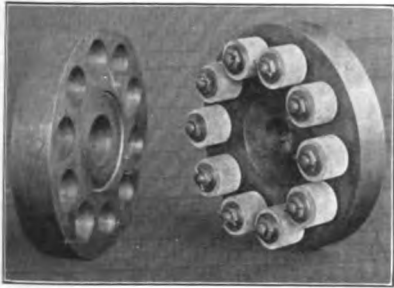


Fawcus Rolling Mill Drive

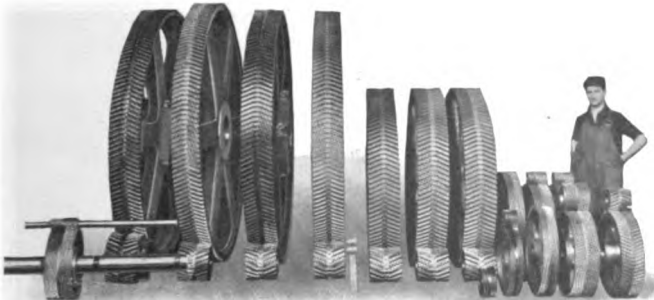
The accuracy of FAWCUS gears makes possible their use for high peripheral velocities and large ratios of speed reduction. They may be advantageously used wherever a positive means of transmitting power is required.

The Fawcus Machine Company will gladly lend the best assistance of its engineering department in recommending and quoting on gearing for all purposes.

Valuable engineering data and additional descriptive information on Fawcus herringbone gears will be mailed to engineers and other interested persons on request.



Fawcus Flexible Coupling



D. O. JAMES MANUFACTURING CO.

Established 1888

Incorporated 1908

1118-24 WEST MONROE ST., CHICAGO, ILL.

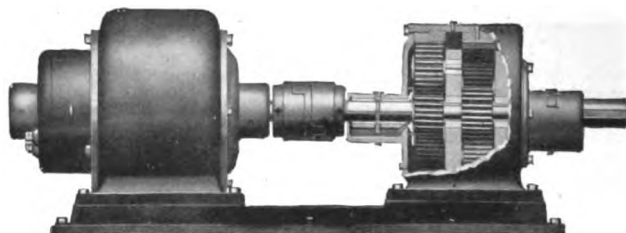
Manufacturers of Speed-Reducing Transmissions, Cut Gears—Gear Cutting

JAMES SPEED-REDUCING TRANSMISSIONS

Ratios 4 : 1 to 1600 : 1

1 H. P. to 100 H. P.

A Centrally Driven Well-Balanced Drive of Great Emergency Strength.



James Speed-Reducing Transmissions were designed to eliminate the objectionable features in evidence in other forms of power transmission, and have been developed to meet the requirements of a variety of applications. The James Reducer meets the demands for a reliable and efficient method for reducing the motor speed. Being fully enclosed, it positively eliminates all chances of dirt getting in the working parts and leaves no gears exposed to injure the workman.

Compactly Constructed: The James Reducer is a unit in itself, compactly constructed, having very much the appearance of an electric motor; is easily installed and can also be arranged for ceiling suspension. It will be found highly efficient, strong and durable, the gearing being entirely enclosed in housing, operating in oil under ideal conditions.

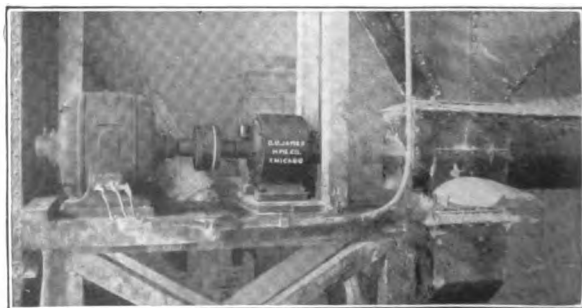


Wide Range of Adaptability: James Reducers are admirably adapted for use in brick plants, cement plants, coal mines, excavation work, steel mills, paper mills, and countless other industries of a like nature, where more or less dirt and grit are constantly getting in the exposed gearing, causing excessive wear, requiring but a few months in many instances for their complete destruction.

They find most satisfactory application for use in operating stokers, ore roasters, cereal cookers, conveying and elevating machinery of every description, car pullers, car loaders, hoists, freight and passenger elevators, stuff chests, agitators, mixers, paint chasers, feed driers, garbage driers. Starch and glucose plants will find the fully enclosed features most acceptable.

Durability: The long life of the James Reducer is largely due to the fact that the gearing is well balanced, all moving parts running in the same direction, the idlers revolving on case-hardened and ground-forged steel pins.

Each Reducer is thoroughly tested before being shipped.

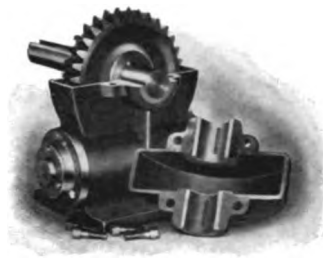


7½ H. P. Reducer Operating Screw Power Conveyor.

Write for our latest Bulletin No. 6, describing James Speed Reducers.

D. O. JAMES MANUFACTURING CO.

ENCASED WORM GEAR REDUCTIONS



The Worms are made of steel and the Worm Gear Reductions are provided with thrust washers on each side of the Worm, so the worm may be run in either direction. In the design of these Reductions care has been taken to see that the worm and the worm shaft shall receive abundant lubrication.

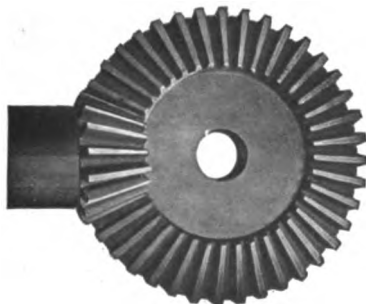
Points of Superiority

1. The worm shaft is fitted in place at the proper center distance, so the worm and gear will run freely.
2. Particular care is taken to see that the worm and gear are cut and hobbed accurately.
3. The housing is constructed so the worm and gear may be easily removed. The worm may be removed by taking out the worm shaft bearings, and the worm gear may be removed by taking off the cap.

When properly installed and not overloaded but used for the horsepower as listed, our encased worm gear transmissions will give the utmost satisfaction. Each Reducer is thoroughly tested before leaving our shop.

CUT GEARS

We are specialists in the manufacture of cut gearing and are fully equipped with the most modern machinery for the accurate production of large or small gears in any quantity.



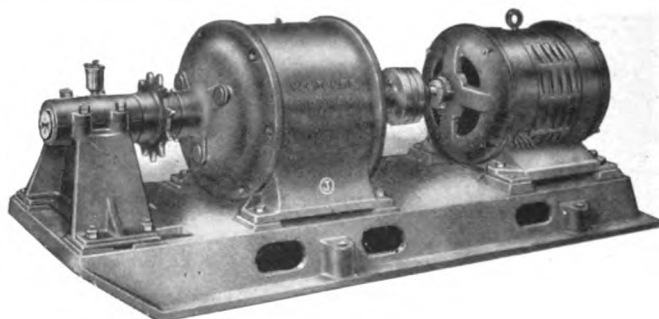
We can furnish gears of every description, our facilities being unexcelled by any plant in the West. We have recently added extensively to our equipment and are better than ever prepared to fill all orders promptly.

Bevel, Mitre, Spur, Spiral, Rawhide and Worm Gears—we can furnish them all and guarantee satisfaction.

W. A. JONES FOUNDRY & MACH. CO.

4401 W. 12TH ST., CHICAGO, ILL.

Manufacturers of Pulleys, Sprockets, Friction Clutches, Rope Drives, Cast Gears, Cut Gears, and General Power Transmission and Conveying Machinery



**5 H. P.
Reducing Set**

Motor speed
720 R. P. M.,
slow speed
shaft 10 R. P.
M., equipped
with outboard
bearing and
sprocket for
driving to con-
veyor head
shaft operating
at 5 R. P. M.

JONES SPUR GEAR SPEED REDUCERS were designed primarily for driving elevators, conveyors, agitators, mixers, dryers, screens and similar machinery where a reduction in speed is necessary between the motor and driven shaft. They have also found a useful application and rapidly gained favor for line shaft service by eliminating large pulleys and hangers, decreasing operating attendance and hazard to workmen, economizing space and power while providing a simple, compact, positive, reliable and practically noiseless transmission.

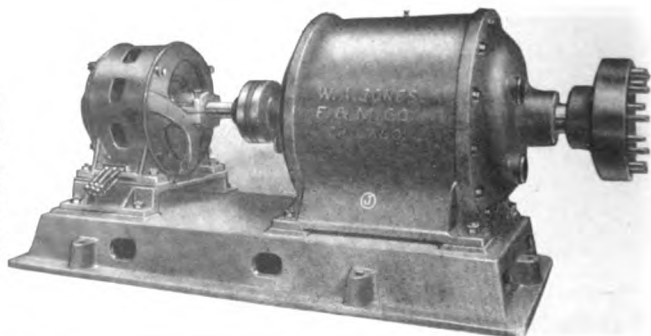
All reductions are accomplished by means of plain spur gears made of forged steel. No internal gears with planetary or semi-planetary motion are employed. Pinion shafts are supported at both ends in liberal bronze bushed bearings eliminating overhanging pins together with all complications of internal mounting and mechanism. Lubrication is automatic and positive, a copious supply for all moving parts being insured by splash.

JONES SPUR GEAR SPEED REDUCERS have an extremely wide range of adaptability, and are manufactured in sizes ranging from one horsepower to two hundred horsepower. We are prepared to furnish plain reducers with standard shaft projections keyseated for couplings, or to assemble reducing sets with motors, flexible couplings and outboard bearings complete on cast iron bases of various designs as illustrated above or to suit individual requirements.

Each reducing problem is given a complete engineering analysis, insuring the selection of a machine amply proportioned for the full duty to be performed. It is only necessary in writing for complete information to mention motor speed and horsepower, driven speed, or ratio required, and class of service or character of operating conditions.

**25 H. P.
Reducing Set**

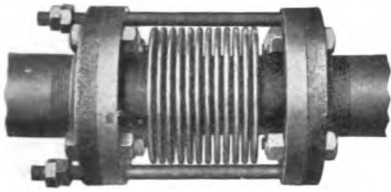
Motor speed
1150 R. P. M.,
slow speed shaft
18 R. P. M.,
equipped with
flexible coupling
for connecting
direct to elevator
head shaft.



R. D. NUTTALL COMPANY

PITTSBURGH, PA.

Manufacturers of Cut and Planed Gears of Every Description



**CUT GEARING
FLEXIBLE COUPLINGS
TROLLEYS**

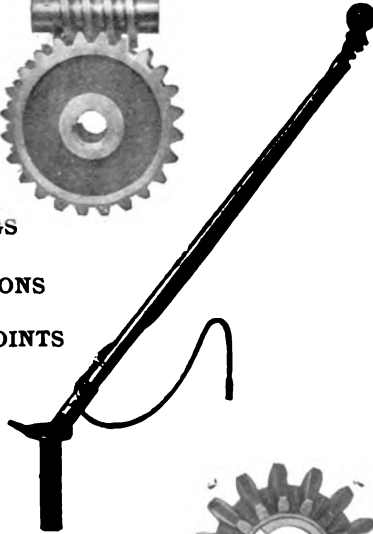
TRACTOR TRANSMISSIONS

**and
ONE PIECE EXPANSION JOINTS**

Gearing for every Railway and Industrial application. Steel, iron, bronze, rawhide or bakelite-micarta gearing to meet any demand.

Heat Treatment for every service.

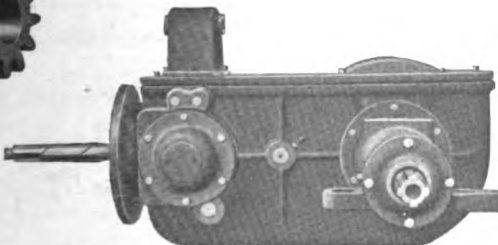
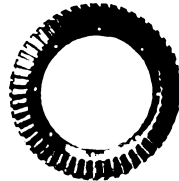
Railway and Mine trolleys, Flexible Couplings and One Piece Expansion Joints.



195

Industrial Gears

Spurs	up to 60 feet
Bevels	" " 20 feet
Spirals	" " 6 feet
Herringbone	" " 30 feet
Worm	" " 12 feet
Internals	" " 30 feet



THE POOLE ENGRG. & MACHINE CO.

Established 1843

WOODBERRY, BALTIMORE, MD.

BOSTON OFFICE, 53 State St.

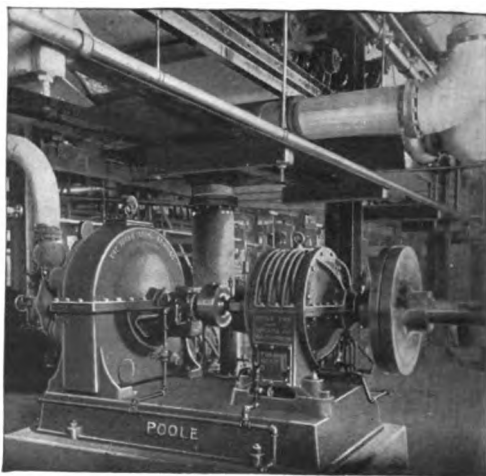
NEW YORK OFFICE, 50 Church St.

Manufacturers of Gears and Power Transmission Machinery

THE TURBO-GEAR (Fast Patents)

The Internal Herringbone Turbo-Gear is a patented, self-contained, mechanical, power transmission interposed between and directly coupled to the prime mover and the driven unit. It may be used as either a step-up or step-down speed-transforming device.

Gear Members: The Turbo-Gear consists of a large, internal, double-helical gear made of a special-analysis, open-hearth, steel forging, heat-treated to increase its ductility and to insure uniform hardness. A double-helical pinion cut integral with the high-speed shaft, made of Halcomb-electric furnace chrome-vanadium steel, heat-treated to an elastic limit of 180,000 pounds per square inch and of proper hardness to minimize wear. Intermediate, double-helical gears made of high-carbon steel-forgings with large bronze bearings are mounted on hardened and ground, forged, steel shafts secured to the cast-steel, slow-speed member.



500 H. P. Turbo-Gear Mill Drive

On this slow-speed member, which is part of the slow-speed shaft, are mounted two heavy-duty S. K. F. Ball bearings, one on each side of the gears, and supported directly by the substantial housing. Thus it will be seen that the slow-speed member and shaft carrying the intermediate gears, and the high-speed shaft and pinion are independent of one another for support and yet each is supported directly by the housing. The internal gear is stationary, the moving members are the pinion and intermediate (planetary) gears.

The gear members in the Turbo-Gear are cut on a gear generator, specially designed for this purpose, that produces a true involute-shape stub tooth of unequalled accuracy and finish.

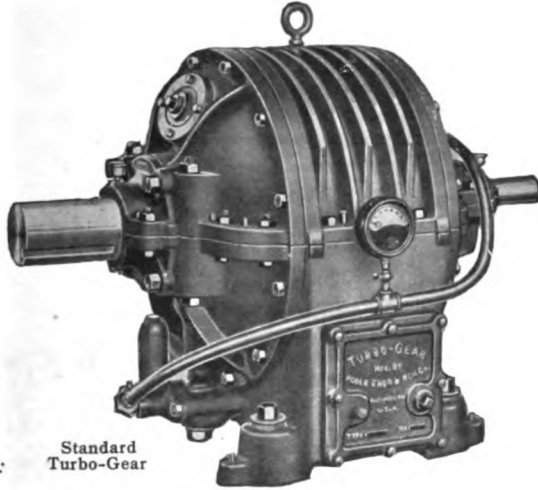
Reliability: The Turbo-Gear is built for long service. It is rugged and compact yet of ample proportion with low tooth pressures to resist overloads and shocks, as well as wear.



THE POOLE ENGRG. & MACHINE CO.

General Application:

Speed, efficiency and safety are the watch-words of the day. The Internal Herringbone Turbo-Gear meets all these requirements. It can be successfully employed for all kinds of gear drives, and used instead of the noisy, inefficient and highly dangerous methods of transmitting power through belts, ropes and chains.



Turbo-Gears are used:

Standard
Turbo-Gear

in Cement Mills	with Blowers	Marine Motors
Rubber Mills	Compressors	Mechanical Stokers
Saw Mills	Electric Motors	Oil Engines
Steel Mills	Fans	Pumps
Textile Mills	Gas Engines	Refrigerating Machines
	Line Shaft Drives	Steam Turbines
on Electric Trucks, Electric Trolley Cars		Steam Engines

There is no type of drive which would not be made less noisy, more efficient and use less power by adopting this transmission.

Advantages:

High efficiency (98-99%).
 Safety (no belts, chains or sprockets, no exposed gears, no guards required).
 Freedom from noise and vibration.
 Small floor space required.
 Totally enclosed (can be used in wet, dirty, dusty, gritty places).
 Simplicity (sprockets, chains, pulleys, belts, hangers, bearings, extra shafting, etc., eliminated).
 Reversibility (can be used to either step-up or step-down the speed) and can drive in either direction of rotation.
 Low first cost (lower than a complete gear, chain or belt drive).
 Low maintenance cost (practically nothing).
 No side strain on shafts or bearings (pure torque transmission).
 Low erection expenses.
 No attention or subsequent adjustments needed. Once properly set up always thereafter in running condition.

Large speed-reduction makes possible the use of a higher-speed, cheaper, more efficient motor.

Wider range of speed reduction than any other single-reduction form of drive.

Cool operation—sure proof of high efficiency.

All tooth pressures are balanced.

High- and low-speed shafts in axial alignment.

Each rotating member independently and directly supported by the housing.

Gears sprayed by a continuous stream of oil under pressure.

Three times as many teeth in constant contact as on any other form of Herringbone Gear drive for equal power. Consequently, low tooth pressure with corresponding increase of life.

Lighter weight per horse power than any other complete reduction gear.

Capacity: The Turbo-Gear can be furnished in any capacity from 2 horse power up

THE BALDWIN CHAIN & MFG. CO.

WORCESTER, MASS.

Makers of Power Transmission Chains and Sprockets

BALDWIN CHAINS

Baldwin Chains for transmission of power are made in two distinct types, block chains and roller chains.

Block Chains consist of solid steel blocks of section resembling either the letter B or figure 8, each separate block drilled to receive two revoluble studs to which the side links are attached. This class of chains is adapted to comparatively light work where the lineal speed of the chain does not much exceed 800 feet per minute.



All Baldwin Block Chains, except No. 5, are made detachable. They are as durable and as strong as the riveted chains of the same size. The value of the detachable feature of these chains is proved by the increased demand for them by the trade who find them very convenient for the ease with which they can alter the length of a chain to suitable requirements, either for changing the gearing or for quick repairs.

Roller Chains, as their name indicates, consist of rollers mounted upon hollow shafts, technically called bushings, a pair of which is fitted into side links to form the equivalent of the solid block used in the block chains. These built-up blocks are then connected by rivets or studs to other side links. The connection is either made permanent by riveting, or made separable by using studs provided with cotter pins at one end. The fastening to be selected will depend upon the nature of the work to which the chains are applied, or to individual preference.

This style of chain is adapted to the heaviest work, and if properly lubricated, is capable of standing up under a lineal speed as high as 1,200 feet per minute, or, under exceptional conditions, somewhat higher.



Cotter Pin Detachable Roller Chain

Baldwin Cotter Pin detachable chain can be easily separated at each link, and is well adapted for heavy motor trucks.

The side links on one side of the chain are riveted to the ends of the studs, and on the other side of the chain, the links are forced on to the studs, and retained by a cotter pin.

Riveted Roller Chain: The material used in the manufacture of these chains is carefully selected and particular attention is paid to the heat treatment given it. The neck of the rivet is a driving fit knurled and forced into the side link by power. This makes a connection that is superior for all requirements.

Baldwin machine-made roller and block chains are suited for a great variety of chain drives. It is our business to furnish estimates for chains and sprockets for various drives.

SPROCKETS: We have a large department equipped with the best facilities for the accurate and economical production of sprockets, in large quantities as well as for sample lots. No order is too small to interest us, nor too large for us to handle.

We carry only one grade of steel for our sprockets which has been selected after long experience, and which appears to be best adapted for wear.



MORSE CHAIN COMPANY

ITHACA, N. Y.

ADDRESS NEAREST OFFICE

BOSTON, MASS., 141 Milk Street
CHICAGO, ILL., Merchants Loan and Trust Bldg.
CLEVELAND, OHIO, 421 Engineers Bldg.
DETROIT, MICH., 1003 Woodward Ave.
GREENSBORO, N. C., 805 Ashboro Street
NEW YORK CITY, 50 Church St., Hudson Term. Bldg.
PITTSBURGH, PA., Westinghouse Bldg.
SAN FRANCISCO, CAL., Monadnock Bldg.
ATLANTA, GA., Earl F. Scott, M.E., 702 Candler Building

CANADA, Jones & Glassco, Reg'd, Montreal, St. Nicholas Bldg., Toronto, Traders' Bank Bldg.
KANSAS CITY, MO., Morse Engineering Co., R. A. Long Building
MINNEAPOLIS, MINN., Strong-Scott Mfg. Co., 413 Third Street, S.
ST. LOUIS, MO., Morse Engineering Co., Chemical Building
LICENSES FOR EUROPE AND EASTERN HEMISPHERE, The Westinghouse Brake Co., Ltd., 82 York Road, King's Cross, London, N.

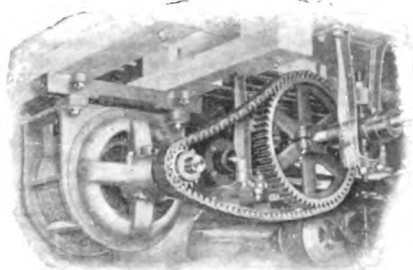
Product—

MORSE SILENT CHAIN

99% Efficiency



Morse frictionless "Rocker Joint" Silent Chains and Sprockets—a high speed, positive, and flexible drive of many and varied applications, which maintains an efficiency of over 99% by actual test, a claim that can be made by no other manufacturer of silent chains. From $\frac{1}{4}$ H. P. to 5,000 H. P. For High or Low Speed.



Overhead Line Shaft Drive

Difference—

The difference between the Morse Silent Chain and all other types is in that unseen and all-important part, the joint. The MORSE is constructed with the undeniable fact always in view—the joint must bear the burden of service in any chain. Instead of a single pin, as in other joints, two special pins, both seated, form the joint. No bushing is required. As the chain bends in circling each sprocket, the curved side of one pin rolls or rocks against the broad, flat side of the other, eliminating destructive sliding friction entirely. When on the straight run between sprockets, the flat sides of both pins are brought together, holding the chain steady and true.

Speed and Service—

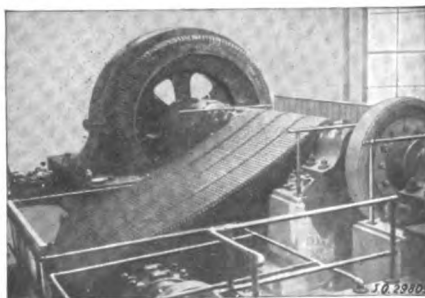
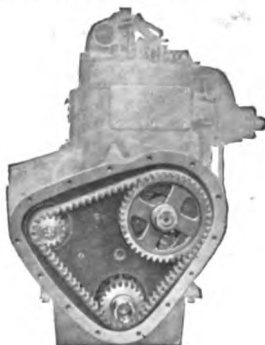
This exclusive "Rocker Joint" construction enables the MORSE to run at a speed far in excess of other chains because lubricant is not essential to its operation; and after years of experimentation (in nearly every line of industry) it is accepted as the most durable chain on the market.

Engineering Assistance—

Our corps of engineers with years of experience in designing and installing millions of horsepower chain drives will assist you to solve your transmission problems.

This service is rendered gratis. Get in touch with them NOW.

The Ideal
Drive
for
Motor
Auxiliaries



The Largest Chain Drive in the World: Five thousand h. p. Morse Silent Chain Drive from water wheels to generator, Ox Bow Hydro-Electric Plant, Snake River, Copperfield, Ore.



THE AMERICAN PULLEY COMPANY

4200 WISSAHICKON AVE., PHILADELPHIA

BRANCH STORES:

NEW YORK
33 Greene St.

BOSTON
165 Pearl St.

CHICAGO
114-116 S. Clinton St.

SEATTLE
536 First Ave., So.

SAN FRANCISCO
14 Natoma St.

Wrought Steel Belt and Sash Pulleys and Pressed Steel Shapes



(Patented)

3", 4", 5" and 6" DIAMETERS

Note the sturdy construction. These small pulleys are as perfect in their way as larger "American" Pulleys. No more can be said.



(Patented)

INTERMEDIATE SIZES

Provided with grooved air escape. Six flat "A"-braced arms (edge on) give great rigidity and least air resistance. Riveting the ends of the arms to inner flange means a round pulley, strong where strength is needed.



(Patented)

44" TO 120" DIAMETERS

Grooved air escape. The hub shell is solidly riveted to half an annular hub ring of angle section. Eight arms, bifurcated at the base, are riveted through laps bifurcations to an annular hub ring.

AMERICAN

STEEL SPLIT PULLEYS

Guaranteed for Double Belt Service

Repeated tests run by engineers of the highest standing have shown that American Steel Split Pulleys will transmit more power with less belt slip than cast iron, wood or other steel pulleys. Data will be furnished on application.

They are about half as heavy as cast iron pulleys, designed for equal service, and save the power required to rotate the unnecessary dead weight of the latter. It takes one horsepower to rotate each ton of weight on shafting.

Tests have shown that, where the arms of pulleys fan the air, it costs sometimes almost a dollar more per pulley per year to rotate them than it does to rotate the American Steel Split Pulley, the arms of which cut the air.

The manufacturers will cooperate with engineers wishing to arrive at the actual facts as to efficiency, putting their testing apparatus at the disposal of the inquirers.

AMERICAN STEEL SPLIT PULLEYS

All "American" Pulleys above 6 inches in diameter have grooved faces.

Listed sizes 3" to 120" in diameter.

Crown and straight faces.

Interchangeable bushings.

No set screws and no keyways unless for unusually heavy duty.

Stocked by over 250 dealers in the United States and Canada.

All pulleys fully guaranteed.

THE W. E. CALDWELL CO.

Established 1884

340 EAST BRANDEIS ST., LOUISVILLE, KY.

Manufacturers of Friction Clutches and Power Transmission Machinery



Caldwell Friction Clutch Pulley

and gives all the adjustment necessary. This is so simple that it can be easily and correctly maintained by anyone.

Most clutch breakages are caused by having one of several adjustments too tight and thus causing one part to carry the entire load instead of the one-fourth or one-sixth that it was designed to carry. This cannot happen with the Caldwell clutch. It is therefore immune from this as well as a number of other clutch troubles.

It is easy to operate as the lever is moved by a toggle link which gives increased power as the stress increases. This and the fact that the band grips the entire circumference of the friction ring gives it great pulling power.

We furnish the Caldwell clutch in the form of friction clutch pulleys, gears, sheaves or sprockets, as cut-off couplings or with an extended hub so that a separate pulley, sheave, sprocket or gear can be attached.

When not specified we furnish a bronze tube bushing but we recommend our cast split removable phosphor bronze bushing.

CALDWELL FRICTION CLUTCHES

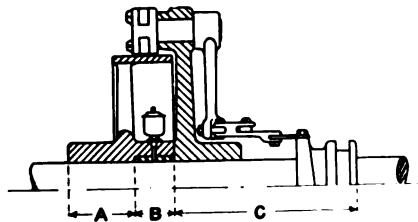
The notable features of this clutch are its simplicity, strength, ease and perfection of adjustment and freedom from breakage.

The basic principle is identical with that of the standard automobile service brake; a flexible band, lined with asbestos and tightened with a lever. In practice it has given equal service with that much used and abused device.

There are only eleven parts. All are designed to have their greatest strength in the direction of the greatest stress and all small parts are of steel.

There is only one adjustment. One screw shortens or lengthens the band

DIMENSIONS OF CALDWELL FRICTION CLUTCH COUPLINGS



Diameter of Clutch Inches	Horsepower at 1000 R.P.M.	Swings Inside of Inches	Largest Bore Inches	Space on Shaft in Inches		
				A	B	C
6	1	10 7/8	2 1/2	2 1/2	1 1/2	7 1/4
8	2	12 7/8	2 1/2	2 1/2	1 1/2	7 1/4
10	4	16	3 1/4	3 1/4	2	9 1/4
12	6	18	3 1/4	3 3/8	2	9 3/8
14	10	21	4	4	2 1/2	11 1/4
16	13	23	4	4 1/2	2 1/2	11 1/4
18	21	25 1/2	4 1/2	4 1/2	3	13 1/2
20	26	27 1/2	4 1/2	5	3	13 1/2
22	32	30 1/2	5	5 1/2	3 1/2	15 1/2
24	38	32 3/4	5	5 3/4	3 1/2	15 3/4
27	48	36 3/4	5 1/2	6	4 1/4	17 1/2
30	60	39 1/2	5 1/2	6 1/4	4 1/4	18 1/2
36	105	46 7/8	6 1/4	7 1/2	5	20 1/2
42	145	52 7/8	7 1/2	8 1/4	5	21 1/2
48	190	61 1/2	8	9	6	24
54	240	67 1/2	9	9 3/4	6	24 3/4

DODGE SALES & ENGINEERING CO.

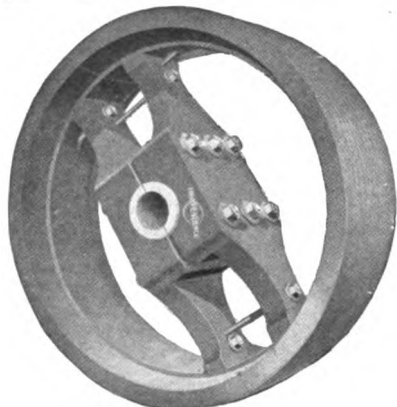
Distributor of the products of

DODGE MFG. CO., MISHAWAKA, IND.

15 Branch Warehouses in the United States.

Dealers in Every Representative City

Designers and Builders of Everything for the Mechanical Transmission of Power



"Independence" Wood Split Pulleys are lighter, stronger, steadier, than any other pulleys of their type; they insure the maximum tractive pull of belts and are guaranteed to give satisfactory service.

In these days when "DELIVERY" is considered of equal importance with "QUALITY," there is a double reason for your specifying "Dodge" pulleys.

DODGE PULLEYS constitute the standard of the world in design, strength, interchangeability, service and prompt delivery.

"Independence" Dodge Wood Split Pulleys are 40 per cent to 80 per cent lower in price than any pulley made from any kind of metal.

They will stand up under any double belt service and will run successfully at any practicable speed.

Dodge Wood Split Pulleys are guaranteed. If they fail in any way to satisfactorily perform the function of a stock pulley, they may be returned and full credit will be allowed.

The Dodge "Standard" Iron Split Pulley is America's ideal service pulley. It is easily put up or taken down, and will fit shafting of all regular sizes. There are no rivets to shear or joints to work loose.

The Dodge "Standard" Iron Split Pulley is impervious to the weather, to water, to steam or acid fumes.

The Dodge "Standard" Iron Split Pulley does not become distorted under strain; it is perfectly round and gives a full 100 per cent belt contact.



Split Iron center wood rim pulley for shock loads, heavy service and high speeds.



Split Iron center wood rim pulley with double arms, especially adapted for high speed, heavy and shock loads.



The Dodge Interchangeable Bushing system makes possible the application of a pulley to any size of shaft within the range of standard bores as follows:

3" diameter	1 1/2" bore
4" diameter	2" bore
5 to 7" diameter	2 1/4" bore
8 to 23" diameter	3" bore
24 to 48" diameter	3 1/2" bore
50 to 72" diameter	4 1/2" bore



Bushings for Standard Iron Splits are made and finished whole, then cracked, and the fractured edges are dressed away slightly to provide for proper clamping clearance.

Two complete bushings are required for each pulley, one for each end of the pulley hub.

DODGE SALES & ENGINEERING CO.

Distributor of the products of

DODGE STEEL PULLEY CORPORATION

Main Office: MISHAWAKA, IND.

Steel Pulley Plant at ONEIDA, N. Y.

Steel Split Pulleys



"Oneida" Steel Split Pulley



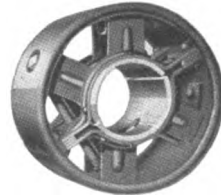
"Keystone" Steel Split Pulley

ONEIDA AND KEYSTONE STEEL SPLIT PULLEYS are now sold exclusively by the Dodge Sales and Engineering Company. The marked superiority of these steel pulleys over all similar products is at once evident to any one familiar with pulley construction.

Both Oneida and Keystone pulleys possess the true oval crown rim which makes for greater uniform belt contact, because of the absence of a groove at the point of greatest tension, such as is found in other types of steel pulleys. Throughout the construction of both Oneida and Keystone pulleys, wherever two pieces of metal are riveted together, these metals are counter-locked male and female, so that there is positively no shearing or lateral strain on the rivets.

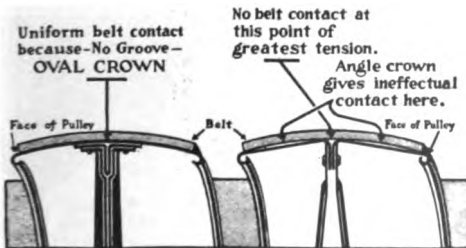
Oneida and Keystone pulleys are made in all sizes up to very large belt wheels for main engine drives.

Valuable literature on the subject of steel pulleys will be sent to anyone on request.



"National" Steel Split Pulley

203



NATIONAL STEEL PULLEYS are made in 3, 4, 5 and 6" diameters, 3" to 6" faces, and fill a long-felt want for a strong, efficient satisfactory small pulley.

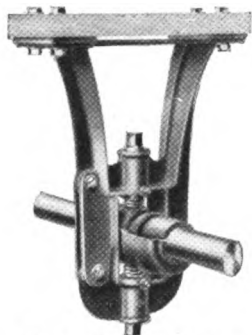
The National pulley has all the advantages of the bushing system, and, being instantly available from dealer's stock, has attained wide popularity.

National pulleys are suitable for use on small motors, dynamos, wood or metal working machinery, and, in fact, in all places requiring small well-balanced, efficient pulleys.

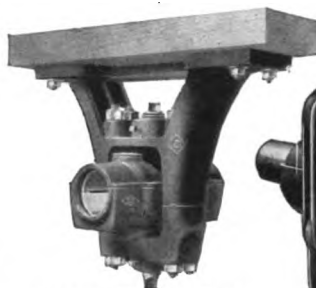
(Continued on next pages)

(Continued from preceding pages)

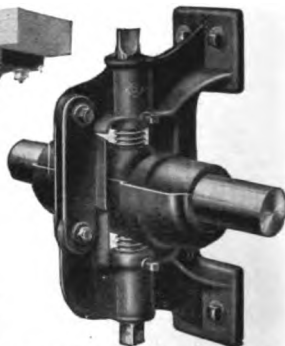
DODGE SALES & ENGINEERING CO.



The Dodge Drop Hanger is ball-and-socket in its fitting.



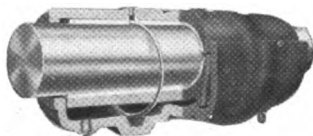
Dodge Heavy Head Shaft Hangers fitted with Ring-oiling bearing. Made in two standard "drops" of 12 and 18 inches.



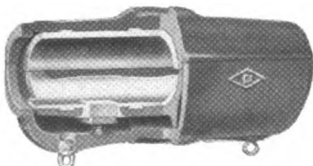
Adjustable Ball-and-Socket Post Hanger with Standard and Self-oiling Bearings. Ample adjustment; machined base.



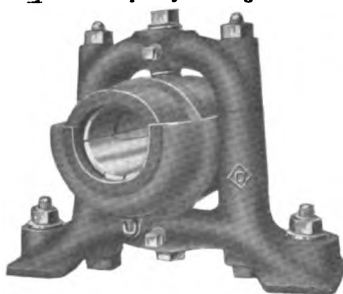
Plain Bearing



Ring Bearing



Capillary Bearing



Adjustable Pillow Block has open frame and ball-and-socket principle. When inverted forms a head shaft hanger.

For pleasing appearance, ample strength, wide adjustability, easy erection, perfect alignment, and general mechanical quality there has never been produced an equal to the **DODGE DOUBLE BRACE, BALL-AND-SOCKET HANGER**, made on both "drop" and "post" styles.

Designed for the utmost strength in form and proportions, it is nevertheless of pleasing appearance in its lines of symmetry and its distribution of metal. To the mechanical eye, these features are all quite in harmony, each having its share in creating and sustaining an impression of confidence in the general excellence.

In the new Dodge Catalog the subject of hangers and bearings is discussed fully. Correct engineering tables are given as well as suggestions for a wide number of uses of hangers; pillow blocks, floor stands, etc.



"**DODGE**" BEARING METAL is intended for use under all general conditions, the "Copper Hardened" brand being better suited for places where there is considerable vibration, knock or pound to contend with.

Our "Genuine" brand is intended for use in bearings where heavy crushing strains are involved. We make a brand of metal for every service condition.



Capillary and Ring-oiling Rigid Pillow Blocks adapted to the most severe service. May be ordered with dust-proof ends.

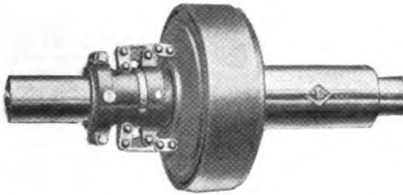


Common Flat Box for use under conditions where moderate powers are involved and where heavier self-oiling equipment is unnecessary.

DODGE SALES & ENGINEERING CO.

THE DODGE SOLID FRICTION CLUTCH is particularly adapted for countershaft use, and such other places where a solid type of clutch can be advantageously employed, and where the power requirements are within the range of capacities offered in this style of construction.

Any kind of a pulley—wood, iron center wood rim or iron, and either solid or split—or any gear, sprocket or sheave wheel, can be used upon this clutch.



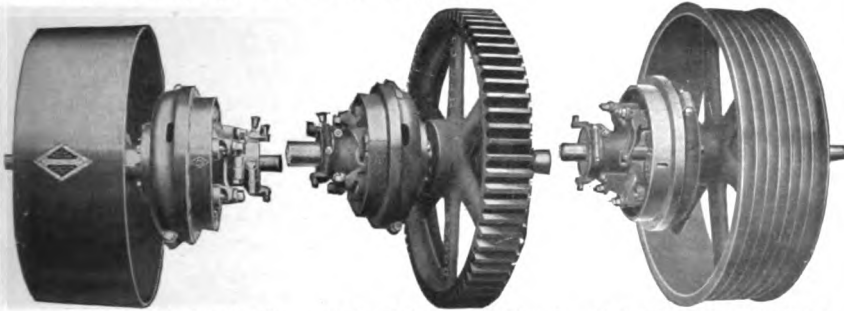
Rated Capacities of Dodge Solid Friction Clutches when Operating at Speeds Shown

Size of Clutch	REVOLUTIONS PER MINUTE																Maximum Speed	Maximum Bore	
																		Reg.	Spec.
	100	150	200	250	300	350	400	450	500										
4"	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	1 1/4"		
5"	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
6"	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
7"	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
8"	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
9"	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
10"	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
12"	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	
14"	15	22	30	37	43	47	51	56	61	66	71	76	81	86	91	96	101	106	
16"	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	
18"	30	45	60	75	85	95	102	110	118	126	134	142	150	158	166	174	182	190	
20"	50	75	100	125	142	157	170	183	196	209	222	235	248	261	274	287	300	313	



DODGE PATENT SPLIT FRICTION CLUTCHES make possible two things of great importance and value:

- (1) The easy and ready installation of the equipment upon a shaft already in place without taking down the shaft or disturbing any of the equipment upon same, and
- (2) The greatest possible facility in the taking off of old parts and the substitution of new, in the event that any repairs or renewals are necessary.



Dodge Split Friction Clutch with Dodge Split Iron Pulley.

Dodge Split Friction Clutch with Spur Gear.

Dodge Split Friction Clutch with Rope Sheave.

THE DODGE PATENT SPLIT FRICTION CUT-OFF COUPLING is used for the purpose of connecting together two sections of shafting in such way that one section can be stopped or started at will while the other section is operated continuously.

The mechanism of the Dodge Patent Split Friction Cut-Off Coupling is the same as is employed with the friction clutch for use with pulleys, gears, sheaves or sprockets. Instead, however, of the extended loose sleeve, a hub part is used, which is keyed to one of the shafts and provides a bronze bushing for receiving the extended part of the other shaft to which is keyed the driving plate of the mechanism.

The subject of clutches is an important one and is fully described in the Dodge Book C-16, in addition to other special literature devoted to the subject. It will be sent on request.

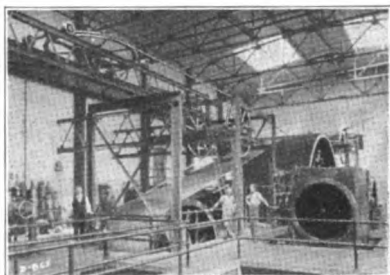
Rated Horse Power Capacities of Dodge Split Clutches

Size of Clutch	REVOLUTIONS PER MINUTE																*Maximum Speeds		Maximum Bore
	100	150	200	250	300	350	400									C. I. Sleeves	Bab. Sleeves and Quills		
	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.	H. P.				
10	6	9	12	15	17	19	20	250	450	3	2 1/4"						350	7	2 1/4"
12	10	15	20	25	28	31	34	250	440	3							250	7 1/2"	3 1/4"
14	15	22	30	37	47	51	51	250	430	3 1/2							250	4 1/4"	3 1/2"
16	20	30	40	50	57	63	68	250	420	4							250	4 1/2"	4
18	25	37	50	62	71	79	85	250	410	5							250	5	4 1/2"
20	32	48	64	80	91	100	109	250	400	6							250	6	6
22	40	60	80	100	114	126	136	250	390	6							250	6 1/2"	6 1/2"
24	50	75	100	125	142	157	167	250	380	7							250	7	7 1/2"
28	80	120	160	200	228	252	272	250	360	7 1/2							250	7 1/2"	8
30	98	147	196	245	280	309	339	250	350	8							250	8	8 1/2"
36	128	192	256	320	365	405	445	250	340	10							250	10	10
42	174	261	348	435	495	555	615	250	330	10							250	10	10
48	242	363	484	605	695	775	855	250	320	12							250	12	12
54	340	510	680	850	975	1095	1215	250	310	12							250	12	12
60	480	720	960	1200	1380	1560	1740	250	300	12							250	12	12

(Continued on next page)

(Continued from preceding pages)

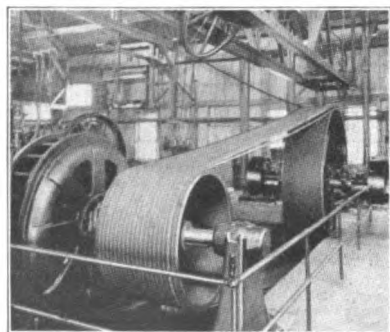
DODGE SALES & ENGINEERING CO.



range of service conditions. The English system is occasionally used on certain large drives where the conditions are proper for that system.

The advantages of transmitting power by means of rope are:

1. Distance and direction in which power is transmitted are practically unlimited.
2. Transmission of any amount of power.
3. Economy in first cost and maintenance.
4. Economy of space.
5. Positive drive, smooth running, and noiseless.
6. No electrical disturbance or loss of power by slipping.
7. Ease and simplicity of distributing power to the several floors of mill buildings, or from one building to another.

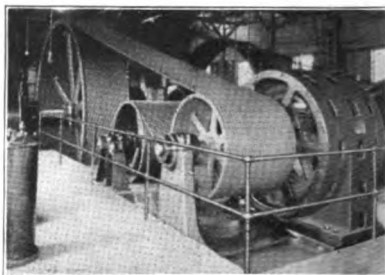


There are now in use two so-called systems of Manila rope driving—the Dodge American, or continuous rope system, and the English, or Multiple rope system.

THE DODGE AMERICAN SYSTEM uses but one continuous rope, winding over all of the grooves, with the rope on the slack side forming a loop over an idler sheave and a traveling tightener, the tightener being controlled by a weight, so that it may automatically regulate the tension of all the wraps of rope.

The English system uses separate and independent, endless ropes in each groove of the wheel, depending on the weight of the ropes for tension, and pinched grooves for adhesion.

The Dodge American System is the one now most universally employed because of its much greater adaptability for a wide



8. While it is important that in the original design of a rope drive all the details should have the attention of an experienced engineer who has specialized on that class of work, the equipment can be successfully operated and maintained by any mechanic of ordinary ability.

9. Precise alignment of shafting not necessary.

10. Lack of that extreme rigidity found in gear drives.

11. In its operation there is present that inertia, or what might be termed fly-wheel effect, which will ease off the peak and shock loads, a particularly valuable feature when motors are involved.

It is not possible to cover here in a complete manner the general subject of rope driving. We issue, therefore, special catalogues devoted to this method of transmitting power, which catalogues will be sent upon request.

Horsepower Capacities of Dodge American System of Rope Transmission
Horsepower of One Rope Based on an Arc of Contact of 180°

Rope Diameter	ROPE SPEED IN FEET PER MINUTE										
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500
$\frac{3}{4}$	1.5	3.0	4.5	5.8	7.1	8.1	9.0	9.7	10.2	10.4	10.3
$\frac{7}{8}$	2.1	4.1	6.1	8.0	9.7	11.3	12.6	13.7	14.5	15.1	15.2
1	2.7	5.4	8.0	10.5	12.8	14.9	16.8	18.4	19.7	20.6	21.1
$1\frac{1}{8}$	3.4	6.8	10.2	13.3	16.3	19.1	21.6	23.8	25.6	27.0	28.0
$1\frac{1}{4}$	4.3	8.5	12.6	16.5	20.3	23.8	27.0	29.8	32.3	34.3	35.8
$1\frac{3}{8}$	5.2	10.2	15.2	20.0	24.6	29.0	33.0	36.6	39.7	42.4	44.6
$1\frac{1}{2}$	6.4	12.2	18.4	23.9	29.4	34.6	39.5	43.9	47.9	51.3	54.1
$1\frac{3}{4}$	8.3	16.6	24.7	32.7	40.3	47.6	54.5	60.8	66.7	71.9	76.4

FALLS CLUTCH & MACHINERY CO.

CUYAHOGA FALLS, OHIO

(SUBURB OF AKRON)

BRANCHES WITH COMPLETE STOCKS

NEW YORK, N. Y.
206-208 Fulton St.

BOSTON, MASS.
52-56 Purchase St.

CINCINNATI, O.
134 W. Second St.

Shafting, Couplings, Collars, Bearings, Hangers, Pillow Blocks, Base Plates, Floor Stands, Head Shaft Hangers, Quills, Pulleys, Sheaves, Friction Clutch Pulleys, Friction Clutch Couplings, and a Complete Line of Power Transmission Machinery

FALLS FRICTION CLUTCHES

Over twenty-five years ago the Falls Friction Clutch first came into prominence by meeting the demand of designers, builders and owners of electrical plants for a connection between the driving units and dynamo and generators, permitting any number of large units to be connected to the same source of power through Clutch Pulleys, Couplings and Quills.

The next demand came in the development of the Gas Engine, requiring a rugged clutch to withstand the severe shocks of this type of power unit, allowing the machine to be started up and brought to working speed before the load is connected.

Today, the Falls Friction Clutch is one of the prime factors in adapting the simplest, most efficient and most useful of power units, the Induction Motor. With a Falls Friction Clutch Pulley or Friction Clutch Cut-Off Coupling the motor can be easily started and load applied after running up to full speed, eliminating the expensive equipment necessary to start the motor under full load and keeping it in its simplest and most efficient form.

Throughout all these years, the Falls Friction Clutch has proven its adaptability to any and all classes of service, from low to high power requirements, and today retains its prestige as the most powerful and efficient of all Friction Clutches.

ROPE DRIVES

We are specialists in designing and equipping rope drives for any and all classes of service. Manila Rope Drives of either American or Continuous Rope System, or English or Multiple Rope System.

Wire Rope Drives and Special Sheaves.

CAST IRON PULLEYS for all services, solid, split, or clamp hub, double arm, heavy rims, and Fly Wheels.

SHAFTING of Hammered Forged Stock and standard drawn or turned.

BEARINGS of all types for the lightest to the heaviest service, either self-oiling, ring-oiling or grease.

We maintain an up-to-date Machine Shop, fully equipped, and have our own foundries, enabling us to specialize to your Transmission Equipment requirements.

Engineering

Corps

at your service.



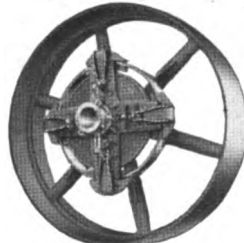
6 Arm F. C. Coupling



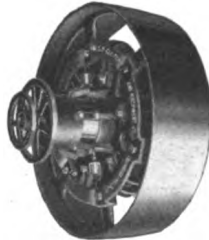
Friction Clutch Quill



Rope Sheave



4 Arm F. C. Pulley



Gas Engine Type F. C. Pulley



Standard Iron Pulleys

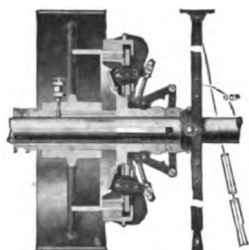


THE HILL CLUTCH CO.

CLEVELAND, OHIO

NEW YORK SALES OFFICE, 50 CHURCH STREET

A Complete Line of Power Transmission Machinery for Belt and Rope Drive, Including the Patented Hill Friction Clutch (Smith Type) and Collar Oiling Bearings



Sectional View Hill Clutch Pulley

(Smith Type)—(Patented)

Built solid or split in sizes from 9 to 1300 H. P. at 100 R. P. M.

HILL FRICTION CLUTCHES

Smith Type

The Smith Type Hill Friction Clutch is the latest design of the well-known Standard Hill Friction Clutch which has been manufactured by us for the past thirty-four years. Vise-like jaws grip the ring in pairs, actuated by a powerful toggle mechanism. No springs are used. Clutch is self-centering and in a cut-off coupling no alignment bushing is required, so when clutch is disengaged there are no revolving parts in contact.

In specifying Hill Friction Clutches, call for the improved Smith Type Hill Clutch to insure your obtaining the latest design and a clutch of great mechanical stability and large starting power—two essential features in successful friction clutch design.

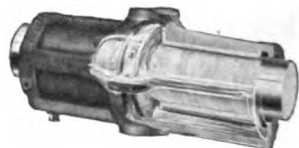
HILL COLLAR OILING BEARINGS

Cleveland Type

In the Hill Collar Oiling Bearing, instead of depending upon a loose ring or chain for conveying oil to journal, a fixed collar is employed, thus providing a positive means of elevating the oil that never fails.

In the Cleveland Type Collar Oiling Bearing oil stored in a reservoir in the bottom of the bearing is continuously elevated by a heavy split collar. Metal wipers deflect the oil which is then distributed along the full length of the journal.

Starting from rest two or three revolutions of the shaft are all that is necessary to completely flood the bearing and thereafter journal operates on a continuous, unbroken film of oil, eliminating wear on the babbitt and creating very high efficiency. The oil collar also acts as a thrust collar, thus eliminating the necessity of using outside shaft collars.



Sectional View Hill Collar Oiling Bearing Cleveland Type, Patented



HILL ROPE DRIVES

American and English Systems of Rope Drives designed, built and installed.

Manufacturers of

**COMPLETE POWER TRANSMISSION MACHINERY
EQUIPMENTS—SPECIAL MACHINERY—GRAY IRON
CASTINGS.**



THE CARLYLE JOHNSON MACHINE COMPANY

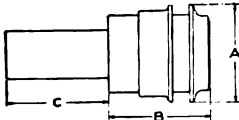
MANCHESTER, CONN., U. S. A.

Manufacturers of Friction Clutches, Cut-off Coupling Clutches, Marine Reverse Gears, Marine Motors

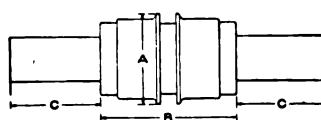
THE JOHNSON FRICTION CLUTCH

A Small, Compact, Light Powered Clutch for Use on the Overhead Shafting and as a Part of All Makes of Machinery

Our Black Catalogue sent free—Write now



Single Clutch

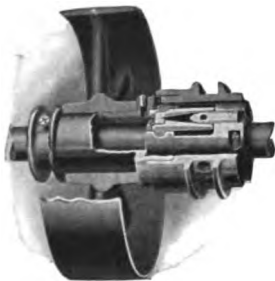


Double Clutch

DIMENSIONS OF STANDARD SINGLE AND DOUBLE CLUTCHES

Clutch Size Number	Horse-power 100 R. P. M.	Largest Diameter Clutch Will Bore	Dimensions				Throw to Engage Clutch	Weight of Standard Single Clutch	Weight of Standard Double Clutch
			A	Single B	Double B	C*			
0	1/2	1 1/8"	3 1/8"	3 1/8"	5"	3"	1 1/8"	10 lbs.	20 lbs.
2	3/4	1 1/4"	4 1/8"	4 1/8"	6 1/8"	4"	1 1/8"	12 lbs.	25 lbs.
4	1	1 1/2"	5"	5"	7 1/2"	5 1/2"	1 1/4"	19 lbs.	32 lbs.
5	1 1/2	1 3/4"	5 1/8"	5 1/8"	8 1/8"	6"	1 1/2"	27 lbs.	43 lbs.
6	2	2"	6 1/8"	6 1/8"	8 3/4"	6 1/2"	1 3/4"	35 lbs.	54 lbs.
8	2 1/2	2 1/8"	6 3/4"	6 3/4"	11 1/8"	8 1/2"	1"	53 lbs.	96 lbs.
10	3	2 1/4"	7 1/8"	7 1/8"	8 1/2"	8 1/2"	1 1/8"	75 lbs.	110 lbs.
11	4	3 1/8"	9 1/8"	9 1/8"	10 1/8"	8 1/2"	1 1/4"	130 lbs.	150 lbs.

* Any length of hub furnished on special order. The diameter of hub *C is usually made from 1 to 1 1/4 inches larger than the diameter of the shaft used, for standard clutches. It is usually from 1 1/2 inches to 1 3/4 inches larger than the diameter of the shaft used, when equipped with a self-lubricating bearing of any style.



Section Broken Away, Showing Clutch Engaged and Pulley Mounted on Hub of Friction Cup

Construction: As seen by the illustration, this type of Clutch has but few parts and is very compact. A body fastened to the shaft carries a split ring in which are inserted a pair of levers. A curve-shaped wedge, which is made part of a shipper sleeve, forces the levers apart, expanding the ring, bringing its outer surface into frictional contact with the inner surface of the friction cup, the hub of which is made to suit requirements.

The leverage is so compounded that it requires but little pressure to operate the Clutch

One screw which moves two taper blocks, set into the levers, adjusts the contact of the ring and cup to any tension. This is easily reached with a screwdriver, through hole in the friction cup. The perfectly smooth shipper sleeve entirely covers the working parts so no dirt can get near them. The Double Clutch requires but

little more space than the Single, and has two friction cups with hubs, on which can be mounted pulleys, cones, gears, etc., of any diameter and face.

REEVES PULLEY COMPANY

COLUMBUS, INDIANA

BRANCH HOUSE: Corner Clinton and Monroe Sts., CHICAGO

Sole Manufacturers of "The Reeves" Variable Speed Transmission, Wood Split Pulley, Wood Split Pulley Clutch and Roller Bearing

The Reeves

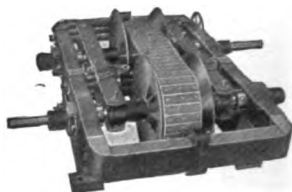
VARIABLE SPEED TRANSMISSION

solves every problem of speed variation. It is a real speed regulator—one that may be applied to any machine and any desired speed secured in a moment, without stopping, not one revolution too fast nor one revolution too slow.

The construction and operation are very simple. Two pairs of cone-faced discs are mounted on parallel shafts in such manner that they are movable. A special V-shaped belt drives from one pair of discs to the other. Two pairs of levers, operated by a right- and left-threaded screw, move the discs so that as one pair separates the other pair is brought together an equal distance, thus changing the belt to different driving diameters and increasing or diminishing the speed of the variable shaft as desired. The speed is regulated by turning a hand wheel in one direction to increase and the other to reduce the speed.

"The Reeves" Transmission is used as a countershaft. You belt from the line shaft or motor to one shaft, which is driven at a constant speed, and the other shaft is variable. From the variable shaft you belt to the machine to be driven.

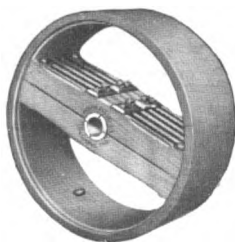
The Transmission is built in fourteen sizes to transmit from 2 H. P. to 150 H. P.; and seven classes to provide variation of 2 to 1 or as high as 10 to 1. It may hang from the ceiling, stand on the floor or be built into the machine it is to regulate.



WOOD SPLIT PULLEY

"The Reeves" Wood Split Pulley is built of hard-wood, select grade, thoroughly air and kiln dried and acclimated. Each segment glued and doubly nailed; arms are edgewise to the load, extending through, built up and made integral with the rim.

The arms split the air—have less air resistance or disturbance than steel. The belt adheres to the face better than to steel or iron and transmits from 20% to 30% more power with equal belt tension. 40% to 80% lighter than steel or iron, costs from 25% to 75% less, is stronger and more efficient in operation. Built any size from 3 inches to 30 feet diameter.



ROLLER BEARING

"The Reeves" Roller Bearing takes the place of plain box in any standard make of hanger. Reduces friction, saves oil and labor, eliminates hot boxes and re-babbiting; saves its cost in a few months. Has numerous exclusive, valuable features.



Special catalog of any line mailed on request.

THE OHIO VALLEY PULLEY WORKS

Established 1886

Incorporated 1896

MAYSVILLE, KY.

Exclusive Manufacturers of Limestone Wood Split Pulleys

THE LIMESTONE PULLEY

Since 1886 this company has been engaged in the exclusive manufacture of wood pulleys and the Limestone Pulley of today is the result of 32 years' experience. Many changes have been made in its construction, but always with the sole end in view of bettering our product.

Construction: Limestone Pulleys are constructed throughout of the best materials obtainable. All of our immense stock of carefully selected lumber is thoroughly air dried for many months and then carefully kiln dried.

The rims are built of sections nailed and glued. The arms are built of White Oak, sections placed edgewise to the strain and these sections increase with the width of face so that the width of spoke is always in proportion to the width of face.

The spokes are built into the rim and there firmly secured in such a manner that the strain of compression is equalized upon an extended portion of the rim.

The Limestone is finished throughout with pure orange shellac.

Bore of Standard Pulleys

3" Diameter.....	1 1/4"
4" to 7" Diameter, inclusive.....	2 1/2"
8" to 72" Diameter, inclusive.....	3 1/2"

One complete bushing of length required by pulley hub is furnished with each pulley without charge.

Extra or Separate Bushings

10" or less of complete bushing—50 cents.
More than 10" of complete bushing, per inch—5 cents.
Less same discount as on pulleys.

Special Bores—Pulleys can be made to order with any special bore within the limits of the diameter of pulleys. For such special pulleys an additional charge is made, dependable upon the size of bore.

Keyseating

Prices for Keyseating Wood Pulleys

Size of shaft, inches	Width of Face of Pulleys			
	12 inches or less	13 to 16 inches	17 to 20 inches	21 to 24 inches
3 or less.....	\$1.25	\$1.75	\$2.35	\$3.00
3 1/4 to 3 3/4.....	1.30	1.80	2.45	3.10
3 1/2 to 4.....	1.50	2.00	2.70	3.35
4 1/4 to 4 1/2.....	2.00	2.50	3.00	3.50
4 1/2 to 5.....	2.35	3.00	3.70	4.35
5 1/4 to 6.....	3.00	3.75	4.50	5.35
6 1/4 to 7.....	3.75	4.50	5.25	6.10

We also make all sorts of special pulleys including taper cone, step cone, flange, rope transmission, offset hubs, extra heavy, iron center, etc.



12" to 36" Diameter

Pulleys 37" to 83" in
Diameter

are constructed in this manner; 84-inch diameter, and larger, are built with such additional arms as the diameter of the pulley makes necessary.

The Limestone in Diameters
3" to 5" Inclusive

is made of maple and is clamped to the shaft by heavy slotted head compression bolts accessible directly from the face of the pulley.

Block Pulleys 6" to 11"
Diameters Inclusive

are made of maple and are clamped to the shaft by compression bolts of varying size and number. These bolts are covered by a removable cap.

T. B. WOOD'S SONS COMPANY

CHAMBERSBURG, PA.

Manufacturing Engineers, Power Transmission Machinery

SHAFTING



Showing Different Forms of Keyseats

We are prepared to furnish shafting of the best steel in diameters up to 24", made perfectly round and straight, thereby insuring easy running and also minimum loss of power.

SAFETY SET COLLARS



Safety Set Collars

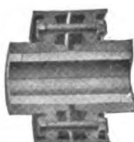
These are made either Solid or Split, bored to fit any size of shafting. Finished all over and fitted with hardened Set Screws. Constructed so that all bolts and Set Screws are protected by flanges projecting beyond heads and nuts. The heads of all Clamping Bolts in Split Collars are slotted.

We also supply Concealed Fast Collars forged from bar steel, bored slightly under size, shrunk on shaft, then turned and finished on shaft centers, thereby insuring a true running collar.

COUPLINGS



Universal Giant Compression Coupling



This line consists of Flange or Plate Couplings, Male and Female, or Standard Plain Face Type. Double Cone, Improved Collins and Universal Giant Compression Couplings, the latter being the Coupling that requires no keys. Ribbed Compression Couplings, Shifting Jaw Clutch Couplings, either Spiral or Square Jaws, Solid Sleeve and Universal Joint Couplings.

HANGERS



Hanger

Our line consists of many different types of Hangers all of a modern design, possessing unique adjusting and power-saving features, fitted with Ring Oiling, Chain Oiling or Plain Grease Cup Bearings.

We are also prepared to equip Hangers with Closed End Bearings and Bearings recessed for Collars. This line comprises Line Shaft, Heavy and Extra Heavy Headshaft Drop Hangers, Post Hangers and Bracket Hangers, all being made in both the Ball and Socket and Four Set Screw or Peerless Type.

We also supply Adjustable Girder Clamps of a unique design, Countershaft Parts or Complete Countershafts.

PILLOW BLOCKS, ETC.



Pillow Block

From our many different patterns we are prepared to supply Rigid and Adjustable Pillow Blocks suitable for operation under various conditions. This classification comprises Plain Flat Boxes, Standard Rigid, Wick, Ring and Chain Oiling Rigid Pillow Blocks and Post Hangers; Solid Journal Boxes, Ball and Socket and Four Set Screw Ring Oiling Adjustable Pillow Blocks; also Plain or Wedge Adjustable Base Plates; Cast Iron and Steel Arch Wall Frames; Cast Iron Wall Brackets, Plain and Wedge Adjustable Ball and Socket Floor Stands, and Fire Wall Sleeves.

T. B. WOOD'S SONS COMPANY

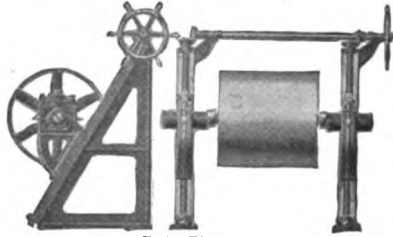
PULLEYS



Pulley

We manufacture Cast Iron Pulleys only, of a correct design having metal properly distributed, same being carefully finished and balanced. This type of pulley we believe superior to others as it is permanent and suited to a wider range of service. We are prepared to furnish Cast Iron Pulleys of every description.

BELT TIGHTENERS, ETC.



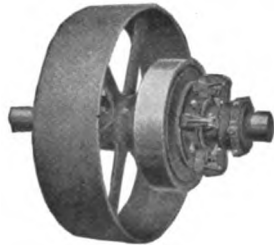
Belt Tightener

This line comprises Belt Tighteners made with "A" Frames and Vertical Side Frames, all with Screw Adjustment; in addition, Rack and Pinion Tighteners for Horizontal or Vertical use. We are also prepared to furnish Stationary and Adjustable Mule Pulley Stands, Single and Double Brace Binder Frames and Guide Pulleys.

UNIVERSAL GIANT FRICTION CLUTCHES

These Clutches are of the Disc Type, of a consistent design throughout and are made either solid or split, the same type of construction being used for all sizes and all speeds. The Clutch is complete within itself either for use as a Cut-Off Coupling or for use in connection with ordinary Pulleys, Gears, Rope Sheaves, Sprockets or any regular or special part that it is desired to use as a driving or driven mechanism.

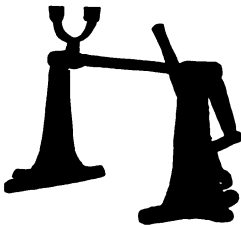
The Sleeve and Body of this Clutch being independent, both are held rigidly in lateral position upon mounting and sustain no end thrust whatever when clutch is thrown in or out of engagement. The Friction Surfaces are protected from dust, dirt and other foreign substances. If desired, Clutch may be equipped with special cover to protect mechanism.



Universal Friction Clutch Pulley

213

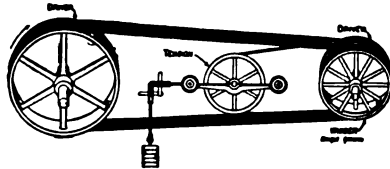
BELT AND CLUTCH SHIFTING MECHANISMS



Compound Lever Shifter Stand

We supply Belt Shifters which may be attached to any of our Hangers. We also furnish for Friction Clutches, Fork and Lever Stands, Compound Levers, Worm Geared and Single or Double Spur Geared Shifter Stands.

ROPE TRANSMISSION



Rope Drive

We are prepared to make complete installations of either English or American System Drives, and also to furnish Rope Sheaves with Grooves of every description; Tension Carriages, Track, Track Hangers and Tail Rope Sheaves.

We have at your command Engineers who have had years of experience in designing and installing satisfactory Rope Driving Equipments, whom we will be glad to have plan drives to meet conditions as they may exist.



THE WILLIAMS FOUNDRY & MCH. CO.

54-56 CHERRY ST., AKRON, OHIO

"AKRON" FRICTION CLUTCHES

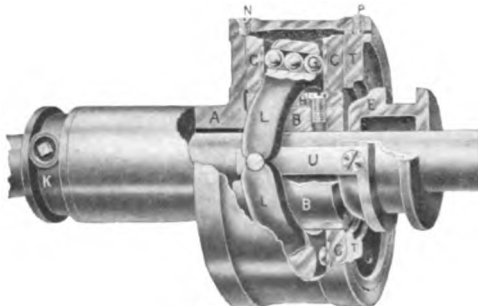
"Just Oil It, That's All"



Friction Clutches have advantages which are so well known that they are now considered necessary in all well equipped factories. By their use perfect control is maintained over the machinery in every part of the plant. The "Akron" Clutch embodies all the principles which make a perfect friction clutch. It has all the desirable features that can be claimed for any of the clutches on the market and many advantages distinctly its own. Akron Clutches are used on a wide variety of machinery and give universal satisfaction. Akron Clutches are of the well known disc type which is now generally regarded by engineers and mechanics as the most efficient and satisfactory type in use. At first glance the construction of the Akron Clutch may appear rather complicated. It is really extremely simple, as a little study of the sectional view cut following will show.

19 Sizes— $\frac{3}{4}$ to 1000 H. P. 100 R. P. M.

Drum "A" carries a hub or sleeve to which pulleys, gears or sprockets may be keyed. One head "T" of the drum is separate. Within the drum are arranged two cast iron friction plates

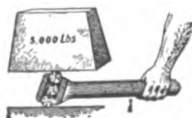


Patented 1908

"C" which keys "H" sunk into fixed or driving member "B" force to rotate with the shaft. Discs "C" are free to move laterally on keys "H." The clutch depends for its power transmitting capacity upon the friction between discs "C" and the corresponding friction surfaces of drum "A" and cover "T." The clutch is engaged by forcing apart friction discs "C" into contact with the drum heads by means of the toggle mechanism, the latter being connected by steel links "U" to sliding sleeve "E." Regular shifter forks attached to yoke "S" are used to throw the clutch in and out of engagement.

The roller toggle is a novel feature of the Akron Clutch. It consists of two forked levers "L" with chilled holes through them in which are lodged three hardened tool steel rollers "G." When levers "L" are perpendicular to the shaft, the line of centers of the three rollers is perpendicular to the faces of the friction discs. The latter are pressed apart into contact with the friction surfaces of drum "A" and cover "T" with immense force. The small cut illustrates in a graphical manner the principle of the roller toggle.

The design of our improved shifter ring "S" is such that the oil is retained while dust and dirt are excluded. The ring is made of cast iron and lined with the best grade of babbitt metal. The clutch is adjusted by means of head "T," which is screwed into drum "A" and provided with notches into which the point of locking screw "P" may engage. The pitch of the screw and the number of notches are so proportioned that an adjustment of one notch corresponds to a lateral adjustment of $\frac{1}{200}$ " between the friction surfaces.



The Akron Clutch requires no attention other than the occasional renewal of oil in the case, which is retained by cover "T" and renewed through oil hole "N."

Write for Catalog and Price List.

AUBURN BALL BEARING COMPANY

Established 1893

22 ELIZABETH STREET, ROCHESTER, N. Y.

Manufacturers and Engineers

Ball Bearings for Every Service

AUBURN FOUR POINT CONE CONTACT BALL THRUST BEARINGS



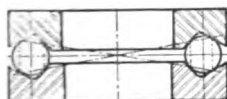
Open T-114 Self-Contained Style Single Thrust for Use where a Circulation of Oil is Desired



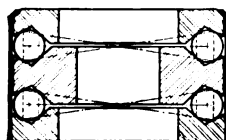
Enclosed T-100 Self-Contained Style Single Thrust for Use where Protection from Dust and Dirt is Desired

Size No.	Bore Inches	Out. Diam. Inches	Thickness Inches	Balls Size No.	Size No.	Bore Inches	Out. Diam. Inches	Thickness Inches	Balls Size No.
5	1 1/4	3 1/2	1 1/4	1/2-16	3	1 3/4	1 1/2	1 1/4	1/2-13
6	1 1/2	3 3/4	1 1/4	1/2-16	8	1 1/2	2 1/4	1 1/4	1/2-15
7	2 1/4	4 1/4	1 1/2	1/2-16	13	1 1/4	2 1/4	1 1/4	1/2-16
8	2 1/2	4 1/2	1 1/2	1/2-16	22	1 1/2	2 1/4	1 1/4	1/2-17
9	2 1/2	4 1/2	1 1/4	1/2-16	37	1 1/2	3 1/4	1 1/4	1/2-16
10	2 1/2	5 1/4	1 1/4	1/2-17	42	2 1/2	4	1 1/4	1/2-20
11	3 1/4	5 1/2	1 1/4	1/2-18	44	3 1/4	4 1/2	1 1/2	1/2-19
12	3 1/4	5 1/2	1 1/2	1/2-18	47	3 1/2	5	1	1/2-35
14	3 1/2	6 1/2	2	1/2-19	*54	5	7	1 1/4	1/2-37
18	4 1/2	8 1/2	2 1/2	1 1/2-18	*55	6	8	1 1/4	1/2-31

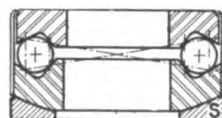
Each ball contacts constantly with both an inner (shorter) and an outer (longer) track on each race, yet it slides on neither of the four tracks, but rolls as freely as in a straight line across a table, and thus practically without friction. Made in sizes from 1 1/8" to 26" outside diameter, a partial list of which is given above.



Open T-101 Style, "Maximum Capacity in Minimum Space" Single Thrust



Enclosed T-150 Style Self-Contained Double Thrust



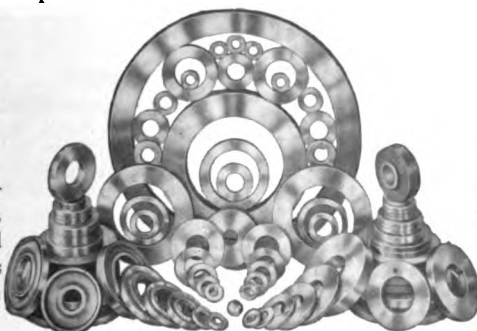
Enclosed T-170 Style Spherical Seated Single Thrust

We design and make special ball thrust bearings for unusual conditions of service when bearings of regular size or design are not entirely suitable. Send particulars of your problems.



VALVE BALLS

Solid and Hollow, of Brass, Bronze and other metals from 1/8 inch diameter up.



COLLARS AND RACES

of tool steel made to customers' specifications.



STEEL BALLS

of alloy and carbon tool steel from 1/8 inch diameter up.

THE FAFNIR BEARING COMPANY

Dragon Bearing Patented July 13, 1915

NEW BRITAIN, CONN.

DETROIT OFFICE: 752 David Whitney Bldg.

CHICAGO OFFICE: 1919 So. Michigan Ave.



Foreword: We are utilizing this page exclusively to introduce to the Engineering Profession the most recent development in Fafnir Ball Bearings, the Dragon Bearing, which, in several essential respects, differs radically from any other type of ball bearing.

It is scarcely necessary to add that Fafnir Ball Bearings are also manufactured in all standard types, well known to the trade for their extreme excellence in material and workmanship, and their unsurpassed efficiency in service.

DRAGON BALL BEARINGS

Although the design and construction of the Dragon Bearing are quite clearly indicated in the accompanying illustrations, it will not be amiss briefly to outline some of the salient features of this wonderful ball bearing.

1. Double rows of balls in standard **single row widths**.
2. The two rows of balls are arranged in staggered relation. Therefore, the balls automatically space one another, completely obviating the necessity for a ball separator.
3. Because it is an angular contact bearing, the Dragon Bearing is especially adapted for carrying both radial load and **heavy thrust load in either direction**, and it is the only double row bearing manufactured in single row widths of which this is true.
4. All single row angular contact bearings must be mounted so that the heavy side of the bearing will receive the thrust and, furthermore, must invariably be mounted in pairs with their thrust load lines opposed. The Dragon Bearing, on the other hand, is a self-contained unit which cannot be mounted incorrectly. The importance of this should be fully grasped.
5. Finally, the Dragon Bearing will be found exceedingly useful and efficient for application under conditions involving radial load plus heavy thrust load in **either direction**. A typical example is to be had in the accompanying illustration of a worm shaft mounting.



We suggest that you write for more detailed information concerning the Dragon Bearing.

HESS-BRIGHT MANUFACTURING CO.

PHILADELPHIA, PA.

Manufacturers of Annular and Thrust Ball Bearings

Important savings in repair and upkeep costs are an integral part of Hess-Bright Ball Bearing performance. This is due to the fact that wear of any sort is eliminated so far as it can be by fine materials and workmanship, or by the ingenuity of engineering talent.

HESS-BRIGHT BALL BEARINGS

Annular Bearings

are made and in stock in sizes up to 110 min. (4.3307 inches) shaft diameter. Or special sizes to order if quantity desired warrants.

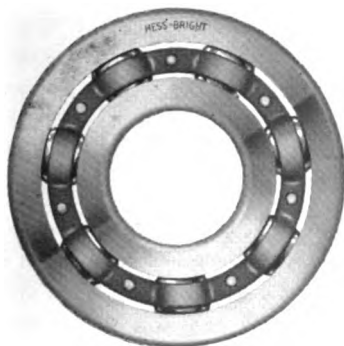
With a given bearing bore or shaft size a choice between "Light," "Medium," or "Heavy" sizes of bearings of increasing capacity and ball diameter is afforded.

Thrust Bearings

are made in sizes up to 105 min. (4.1339 inches) shaft diameter or larger sizes on special order. There are two series of sizes, "Medium" and "Light," and one or two direction types with or without aligning washers though we advise their use.

217

Annular Bearings are capable of carrying considerable load, amounting in the deep groove or Monarch type to about 25 per cent. of their rated radial capacity. Where it seems desirable to subject annular bearings to thrust load, it is advisable to consult with the bearing manufacturer.



GURNEY BALL BEARING COMPANY

Conrad Patent Licensee

JAMESTOWN, N. Y.

**Ball Bearings with Exceptionally Large Load Capacities
Bearings of Annular Type for Combined Radial and Thrust Loads**

Highest Load Capacities

Gurney Ball Bearings have higher load capacities than any other ball bearing because they carry a greater number of large sized balls in a continuous raceway accurately ground, so that the race contour follows closely the contour of the ball. This accurate grinding of raceways gives an increased area of contact between ball and race, and so reduces contact stress.

Send for our catalog and compare Gurney load ratings with the ratings of other makes of ball bearings.



Eliminate Separate Thrust Bearings

Every ordinary thrust bearing must be provided with some kind of radial bearing to keep the shaft in alignment. The Gurney Radio-Thrust Bearing carries any desired proportion of radial and thrust load on a single row of balls, and obviates the necessity for separate radial and thrust bearings. Our new Bulletin G-2 explains and illustrates the application of this type of bearing to more than twenty different types of machinery.

Authoritative Engineering Advice

To make sure that Gurney Bearings will give maximum service, we have a Service Engineering Department which advises the proper types and sizes of bearings to be used, and designs suitable mountings, dirt seals, etc. These Engineers are specialists in this work and we guarantee the satisfactory operation of bearings installed according to their recommendations.

Whenever you have a troublesome bearing problem of any kind, give these Engineers a chance to help you solve it. Sketches or blue prints of the design with load and speed data will enable them to work intelligently and make positive recommendations.



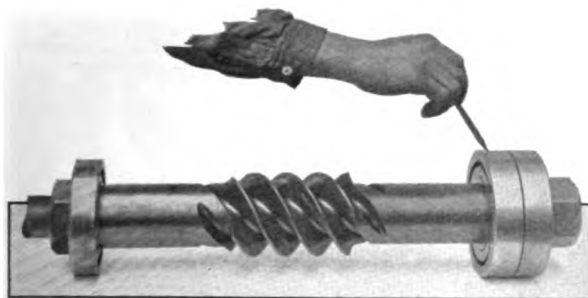
GURNEY BALL BEARING COMPANY

Conrad Patent Licensee

JAMESTOWN, N. Y.

Ball Bearings with Exceptionally Large Load Capacities
Bearings of Annular Type for Combined Radial and Thrust Loads

Two Typical Installations of Radio-Thrust Bearings



Heavy Duty Worm Drive

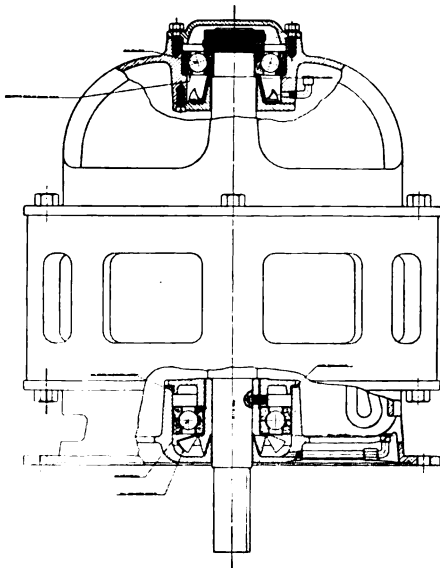
The Gurney Duplex Bearing at the right of the illustration carries both the radial and thrust loads on the outer end of this high-speed worm shaft. The worm is direct-connected to a 150 h. p. Terry Steam Turbine, operating at 3600 r. p. m. The worm-gear reduction is made by the Cleveland Worm Gear Company, Cleveland, Ohio.

The radial load on the Duplex Bearing is 1075 pounds, and the thrust load is 2610 pounds. Gurney Bearings are used on this job because no other type of bearing will carry these heavy thrust loads at such a high speed.

The Duplex Bearing is composed of two Radio-Thrust Bearings specially fitted to each other.

Vertical Electric Motor

The armature of this 50 h. p. vertical motor is mounted on two Gurney Bearings. The Radio-Thrust Bearing at the top carries the weight of the armature and also acts as a steady bearing. The radial bearing at the bottom carries the load due to belt pull and has a load capacity of 3000 pounds at 1800 r. p. m.



HYATT ROLLER BEARING CO.

METROPOLITAN TOWER, NEW YORK CITY

Manufacturers of Bearings for Mine Cars, Countershafts, Service Cars, Trucks of all kinds, Cranes, Trolleys and Hoists, Steel Mill Equipment, Concrete Mixers, Textile Machinery, Etc.



The rapidly growing use of anti-friction bearings in all classes of machinery to conserve power, to cut down lubrication and attention costs and to insure dependability of operation, is a matter of especial interest to every engineer.

Eventually anti-friction bearings will entirely displace plain friction bearings as succeeding years increase the demand for more economical, more dependable operation of machinery. The gigantic wastes that have existed in our country due to its abundance of fuels and materials are being slowly but surely checked and anti-friction bearings are one of the soundest means of eliminating these wastes.

HYATT ROLLER BEARINGS

Are anti-friction bearings that merit the careful consideration of every thinking engineer, because they are designed and constructed according to sound engineering principles.

By reason of the slight flexibility of the roller, Hyatt Bearings carry the load on an area. This materially reduces the unit load and enables the surfaces of the shaft and the bearing to stand up under shock loads without permanent deformation.

The chrome-vanadium steel rollers are heat treated to a hardness that successfully resists wear. Assembled in a correctly designed substantial cage, they provide an anti-friction unit that is simple to apply and that is dependable and effective.

Hyatt Roller Bearings have been used for years with unvarying success in steel mill cars and roller tables, machine tools of all kinds, mine cars, conveyors, industrial trucks, textile machinery, railway service cars, cranes, trolleys and hoists, automobiles, tractors, etc.

You will find our Engineering Bulletins of interest and value to you. They contain complete designs for the application of Hyatt Roller Bearings to all classes of machines. We shall be glad to send you Bulletins covering the applications in which you are interested.

HYATT ROLLER BEARING CO.

The widespread need for increased efficiency in production has caused more attention to be paid to the power savings made possible by reducing the friction of moving parts of machinery. The perfection of anti friction bearings has eliminated a large percentage of the power waste caused by ordinary friction bearings.

The true rolling motion of the Hyatt Line Shaft Roller Bearing eliminates at least 50% of the friction that exists in plain babbitted bearings, making possible a reduction of 15% of the total power. By the use of Hyatt Line Shaft Roller Bearings, therefore, you can either increase your present equipment without enlarging your power plant or you can effect a 15% reduction in your power bill—a saving of special importance at this time.

HYATT LINE SHAFT ROLLER BEARINGS

are made for all standard sizes of shafting and being split can be slipped into position without removing pulleys, couplings or hangers. The boxes are filled with oil after which they need not be lubricated for another four months.



Hyatt Line Shaft Box
Mounted in a Standard 4-Point
Set Screw Hanger

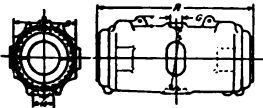


Hyatt Line Shaft Box
Mounted on U-G Hanger

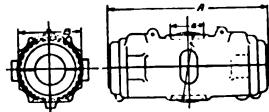
The bearing itself consists of a series of flexible rollers of chrome vanadium steel, retained in position by a substantial steel cage. Being hollow and having helical openings throughout their length, the rollers continually cover all bearing surfaces with oil.

Hyatt Line Shaft Roller Bearings are sturdily and accurately constructed and give satisfactory service year in and year out. There are many of them still in operation after 25 to 30 years of practical service—earning dividends through savings in power, oil and labor.

Install Hyatt Line Shaft Roller Bearings in your present hangers and on all new equipment. Save power, oil and attention. Our Line Shaft Bulletin containing prices and sizes of boxes and hangers and engineering data will be of real value to you.



DIMENSIONS OF HYATT STANDARD BOXES



Either U-G or B. & S. boxes may be used in four set screw hangers

Diam. of Shaft, Inches	Approx. Weight, Lbs.	A		B		F		G		H
		BS	UG	BS	UG	BS	UG	BS	UG	
1 1/4	11	8 1/4	8 1/4	3 3/4	3 5/8	3 3/4	3 7/8	1 1/4	1 1/4	1 1/4
1 1/2	14	9 1/4	9 1/4	3 3/4	3 5/8	3 3/4	4	1 1/4	1 1/4	1 1/4
1 3/4	22	10 1/2	10 1/2	4 1/2	4 1/2	4 1/2	4 7/8	2 1/2	1 3/4	2 1/4
2	27	11 1/2	11 1/2	4 1/2	4 1/2	4 1/2	5	2 1/2	1 3/4	2 1/4
2 1/4	38	13	13	5 1/2	5 1/2	5 1/2	5 1/2	3	1 3/4	2 1/4
2 1/2	40	14	14	5 1/2	5 1/2	5 1/2	6	3	1 3/4	2 1/4
2 3/4	60	15 1/4	15 1/4	6	6 3/8	6 1/2	6 1/2	3 1/2	2 1/4	2 1/4
3	67	16 1/2	16 1/2	6 1/2	6 3/8	6 1/2	6 3/4	3 1/2	2 1/4	2 1/4
3 1/4	110	17 1/4	17 1/4	7 1/4	7 1/4	7 1/4	7 3/4	3 3/4	2 3/4	2 1/4
3 1/2	182	19 1/2	...	8 1/4	...	10 1/2	...	4 3/8	...	...
3 3/4	230	20	20	8 1/2	8 1/2	10 1/2	9 3/4	4 3/8	2 3/4	3 1/4
4	280	22 1/4	22 1/4	9 1/2	8 3/8	10 1/2	10	5 1/2	2 3/4	3
4 1/4	330	24 1/4	...	10	...	10 1/2	...	6 3/8	...	...
4 1/2	380	24 1/4	...	10 1/4	...	12	...	6 3/8	...	...
5 1/4	500	30	...	12	...	12 3/4	...	6 3/8	...	...

THE NEW DEPARTURE MFG. CO.

BRISTOL, CONN.

Conrad Patent Licensee

Western Branch
818 Ford Bldg
DETROIT, MICH.

DISTRIBUTORS
in all trade centers
of the United States

NEW DEPARTURE



BALL BEARINGS

New Departure ball bearings are the latest and most important improving and refining development, the advantages of which can be applied to all classes of machinery.

Quality Assured

New Departure ball bearings are manufactured in a New England factory where high standards of quality have been maintained for a quarter of a century and have given the manufacturers a favorable reputation throughout the world. The sincere aim of this Company has been and is to manufacture a ball bearing approaching as closely to absolute perfection as is humanly possible. In furtherance of this attainment, a highly specialized corps of laboratorial and mechanical engineers are employed, special machinery, exclusive processes and methods have been devised, and an inspection and testing system is in operation that is more exacting in its requirements of quality than found in almost any other industry under the sun.

The quality of New Departure bearings is further assured by the use of special chrome alloy steel, subjected to an ultra refined heat treatment, to further refine an already fine structure.



THE NEW DEPARTURE MFG. CO.

BRISTOL, CONN.

Conrad Patent Licensees

DISTRIBUTORS
in all trade centers in the
United States

Western Branch
818 Ford Bldg.
DETROIT, MICH.

NEW DEPARTURE



BALL BEARINGS



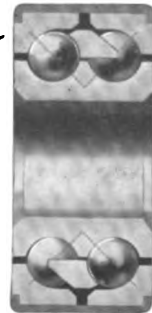
Cut Open View,
Double Row

Double Row Type

This bearing is the most successful two-purpose ball bearing available. The design of the bearing and the angular contact of the two rows of balls with the raceways render this bearing equally efficient in carrying radial loads or resisting thrust stresses from whatever direction they may come, singly or in combination. The separator is so designed that each row of balls travels independently within its own spacing member, pockets of

which are filled with lubricant, each ball rolling friction free in a film of oil. Except in those few places where only strictly radial loads and stresses occur, this bearing offers important advantages. It can be used successfully to replace combinations of single row and thrust bearings, simplifying designing, machining, assembly, and economizing installation cost.

Another distinctive advantage is that it offers permanently correct, non-adjustable assembly and avoids danger of misalignment of separate members which is apt to occur when two or more separate bearings are used to do the same work. This bearing is made to standard sizes of bore and diameter, but not of width.



Cross Section,
Double Row

Descriptive and dimensional tables with price list sent upon application.

THE NEW DEPARTURE MFG. CO.

BRISTOL, CONN.

Conrad Patent Licensee

Western Branch
818 Ford Bldg.
Detroit, Mich.

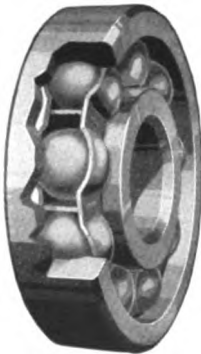
DISTRIBUTORS
in all trade centers
of the United States

NEW DEPARTURE



BALL BEARINGS

Single Row Type



Cut Open View,
Single Row

A high quality ball bearing combining best materials, workmanship, and precision of dimension with correct design for withstanding radial loads imposed without friction. The largest size and number of balls possible for a given bearing are used and the ball spacer is so designed that the balls perform their work with practically no rubbing against the sides of their pockets. This bearing is

made to internationally standardized dimensions.



Cross Section,
Single Row



Cut Open View
Magneto Type

Magneto Type

A ball bearing that most truly is built like a watch, small in size, exquisite in the precision of its every part and detail, and so designed as to be specially adaptable to noiseless running at high speeds.

Descriptive and dimensional tables with price list sent upon application.

THE NEW DEPARTURE MFG. CO.

BRISTOL, CONN.

Conrad Patent Licensees

Western Branch
818 Ford Bldg.
DETROIT, MICH.

DISTRIBUTORS
in all trade centers
of the United States

NEW DEPARTURE



BALL BEARINGS

Radax Type



Cut Open View
Radax Type

This bearing is capable of carrying radial loads and taking one-direction thrust stresses. The point of contact of balls and races is at $11\frac{1}{2}$ degrees, thus making the radial and thrust capacities practically equal. The cup and cone are separable but the use of a retaining spring in the cup permits the handling or the housing of the bearing as a unit. The separator simulates the

perfected single row type which allows maximum number of balls to the bearing. The same standards of quality that are applied to the manufacture, inspection and test of the two bearings named above, obtain in this product also.



Cross Section
Radax Type

The application of ball bearings to various uses has ever been of the keenest interest to the engineers of The New Departure Mfg. Company. Constant and painstaking study, not only of the latest developments of those branches of industry most benefited by power saving and efficient running machinery particularly qualify our organization to advise and collaborate regarding designs, which service is always freely and promptly at the command of clients.

Descriptive and dimensional tables with price list sent upon application.

THE NORMA COMPANY OF AMERICA

1790 BROADWAY, NEW YORK, N. Y.

"Norma" Ball, Roller, Thrust and Combination Bearings

"NORMA" BALL BEARINGS



Open type, separable bearings of extremely high precision, rigidly mounted, silent running, with every element in workmanship and design contributing to high-efficiency, long-time service; notably successful in high-speed operation, being the standard bearings with most of the leading manufacturers of high-speed electrical apparatus.

"NORMA" ROLLER BEARINGS

Heavy-duty, high-efficiency bearings preëminently adapted for service where shock, jar, vibration and sudden load variations must be encountered; double the load capacity of a ball bearing of the same dimensions; temporary overload capacity up to 50 per cent of their own rating; high-speed, quiet-running units of extreme precision and maximum durability.



"NORMA" THRUST BEARINGS

Precision units affording maximum anti-friction efficiency under end thrust loads; designed to afford long-service durability and silent-running qualities; made in several styles, single and double, both without housings and with housings of several types giving self-contained advantages.



"NORMA" COMBINATION BEARINGS

Self-contained units affording perfect adjustment and maximum anti-friction efficiency under combined radial and thrust load; two types—combined annular and ball thrust, and combined roller and ball thrust; distinguished by high precision, open-type construction, rigid mounting, silent-running and high-speed qualities.

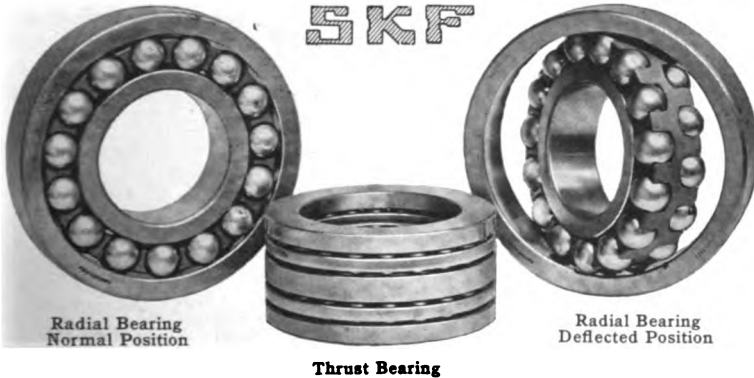


Send for the complete catalog
"Norma Precision Bearings."

S K F BALL BEARING CO.

HARTFORD, CONN.

Self-Aligning Radial, Adapter and Thrust Ball Bearings; and Self-Aligning Shaft Hangers and Pillow Blocks



S K F Radial Ball Bearings

have the exclusive feature of self-alignment, possessed by no other ball bearing. The inner surface of the outer race is a section of a hollow sphere whose center is on the axis of the shaft. The inner race and balls are free to turn in any position within the race—a true ball and socket action. Thus, any deflection or springing of the shaft does not bind the bearing; the bearing compensates for this deflection.

S K F Thrust Bearings

Single or Double Thrust with flat seats. Single or Double Thrust with spherical seats and aligning washers, making a self-aligning thrust bearing. Also, an exclusive S K F type known as the self-contained, self-aligning double thrust bearing. This bearing is very simple to mount, carries all thrust loads and is at the same time self-aligning, compensating for deflection of the shaft.

227

S K F Transmission Equipment

For transmission equipment the S K F Adapter Bearing is mounted in an oil-tight, dust-proof housing and held in drop hanger, post hanger or pedestal pillow block. A rigid pillow block is also made, in which the pillow block itself houses the bearing.

No machining of the shaft is necessary



Shaft Hanger

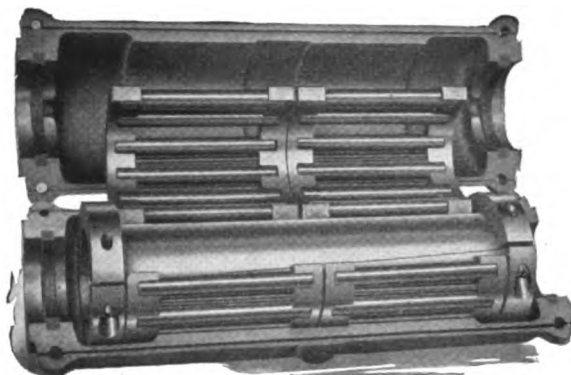
in mounting the S K F Adapter Bearing. The bore of the inner race is tapered, and fits on a conical split sleeve. This sleeve is simply slipped over the shaft, the bearing is drawn in place on it and a lock nut holds the bearing firmly in position on the shaft.

Special catalogs, literature or information gladly furnished for any application.

ROYERSFORD FOUNDRY AND MACHINE CO.

52 N. 5TH ST., PHILADELPHIA, PA.

Manufacturers of Roller Bearings and Other Power Transmission Machinery



**OLD
RELIABLE
"SELLS"**

*Known and
used the
world over*

Double Structure-Heavy Duty Type

"Sells" Roller Bearings can be used wherever there's a hanger. On post hangers, drop hangers, or pillow blocks, "Sells" can be adapted without the expense and inconvenience of taking down the shafting, and removing the pulleys, couplings or collars.

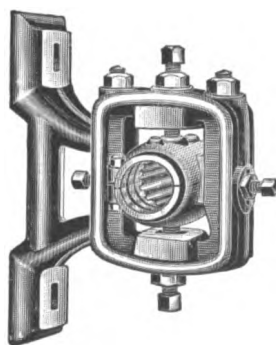
The split principle of "Sells" makes the work of installing extremely simple. They can be installed over night.

Note in the above picture the split steel bushing that prevents wearing of shaft; the collars that clamp it securely to the protected shaft.

See the split roller structure; how it separates the rollers, preventing roller-against-roller frictions. It holds the rollers parallel to the shafting and each other. Friction is obviously eliminated at every point because the bearing is of the full floating type.

We guarantee a reduction in friction load of from 25% to 50%. That means greater efficiency from coal, current costs are decreased, and lubricating bills are cut in half through the use of "Sells" Roller Bearings.

Hundreds of concerns are making these savings. Let us give you specific instances with figures and signatures.



**The "Sells" Roller
Bearing Post Hanger**



**The "Sells" Roller Bearing
Drop Hanger**

ROYERSFORD FOUNDRY AND MACHINE CO.



ROLLERINE

"Rollerine" is compounded expressly for the lubrication of "Sells" Roller Bearings or any roller and ball bearings. "Rollerine" contains no wax, talc, soapstone, resin, resin oil or any other gum of high frictional properties. When used to lubricate "Sells" Bearings, "Rollerine" gives maximum efficiency. Write for free sample.

The "Sells" Oil-and-Grease Gun affords the most efficient means for applying "Rollerine" to "Sells" Roller Bearings. It is also adapted for heavy oils and greases of all kinds.

"Sells" Roller Bearing Boxes
with Single Roller Structure
for Line Shafts

Size of shaft, inches	Price	Length of box, inches	Width of box, inches	Height of box, inches	Code
1 1/4" & 1"	\$ 3.00	6 3/4"	2 1/4"	2 3/4"	Ibex
1 1/2" & 1 1/4"	3.50	6 1/4"	3"	3 1/4"	Ice
1 3/4" & 1 1/2"	4.00	7 1/4"	3 1/4"	3 3/4"	Idea
1 7/8" & 1 3/4"	4.75	8"	3 3/4"	4 1/4"	Idiot }
2" & 1 7/8"	5.50	8 3/4"	3 3/4"	4 3/4"	Idol
2 1/4" & 2"	6.75	9 3/4"	4 1/4"	4 3/4"	Ignite
2 1/2" & 2 1/4"	7.75	10 1/4"	4 3/4"	5 1/4"	Ilk
2 3/4" & 2 1/2"	9.50	10 3/4"	5 1/4"	5 1/4"	Image
2 7/8" & 2 3/4"	11.25	11"	5 1/4"	5 1/4"	Imbibe
3" & 2 7/8"	17.25	11 3/4"	5 1/4"	6 1/4"	Immerse
3 1/4" & 3"	19.25	12 3/4"	6 1/4"	6 1/4"	Impose
3 1/2" & 3 1/4"	33.50	14 1/4"	6 1/4"	7 1/4"	Imposter
3 3/4" & 3 1/2"	38.50	15"	7 1/4"	7 3/4"	Improve
4" & 3 3/4"	44.00	15 1/4"	7 3/4"	8 1/4"	Inapt
4 1/4" & 4"	50.00	16 1/4"	8"	8 3/4"	Inca
4 1/2" & 4 1/4"	56.50	16 3/4"	8 1/4"	8 3/4"	Incase
4 3/4" & 4 1/2"	64.00	17"	8 1/4"	9 1/4"	Income

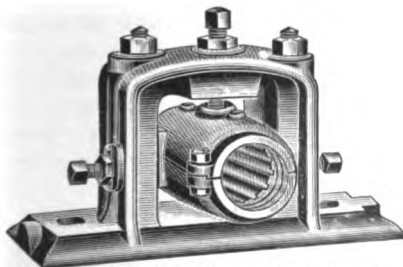
Heavy Duty "Sells" Roller Bearing Boxes
with Double Roller Structures
for Main or Jack Shafts and Heavy Belt Pulls

Size of shaft, inches	Price	Length of box, inches	Width of box, inches	Height of box, inches	Code
1 1/4" & 2"	\$ 9.50	13"	3 1/4"	4 1/4"	Impound
2" & 2 1/4"	11.75	13 3/4"	4 1/4"	4 3/4"	Imprint
2 1/4" & 2 1/2"	13.25	14 3/4"	4 3/4"	5 1/4"	Inarch
2 1/2" & 2 3/4"	16.25	15 1/4"	5 1/4"	5 1/4"	Inborn
2 3/4" & 3"	19.50	15 3/4"	5 1/4"	5 1/4"	Inbred
3" & 3 1/4"	29.50	17 1/4"	5 1/4"	6 1/4"	Inclose
3 1/4" & 3 1/2"	33.00	17 1/4"	6 1/4"	6 1/4"	Incoc
3 1/2" & 3 3/4"	47.00	19 1/4"	6 1/4"	7 1/4"	Indeed
3 3/4" & 4"	55.00	19 3/4"	7 1/4"	8"	Indent
4" & 4 1/4"	63.00	21"	7 1/4"	8 1/4"	Index
4 1/4" & 4 1/2"	70.00	21 3/4"	8"	8 1/4"	Indigo
4 1/2" & 4 3/4"	80.50	22 3/4"	8 1/4"	8 3/4"	Induce
4 3/4" & 5"	89.50	24"	8 1/4"	9 1/4"	Infant
5" & 5 1/4"	115.00	24 3/4"	9 1/4"	10"	Increase
5 1/4" & 6"	158.00	26 3/4"	10 1/4"	10 3/4"	Incrout

229



"Sells" Oil-and-Grease Gun



The "Sells" Roller Bearing Floor Stand

The hand wheel operating a pinion meshing in the rack makes it easy to control the amount of lubricant forced out. Its economy is very apparent. A curved nozzle adds to the convenience in applying the lubricant.



STANDARD ROLLER BEARING CO.

PHILADELPHIA, PA.

SALES OFFICES

DETROIT, MICH., 936 Woodward Ave.
CHICAGO, ILL., 2206 S. Michigan Ave.
INDIANAPOLIS, IND., 822 Hume-Mansur Bldg.
NEW YORK CITY, 1737 Broadway

BOSTON, MASS., 159-A Massachusetts Ave.
CLEVELAND, OHIO, 2062 Euclid Ave.
SAN FRANCISCO, CAL., 41 Spear St.
ST. LOUIS, MO., 3126 Locust St.

Manufacturers of S. R. B. Maximum Silent Type Annular Ball Bearings (Single Row and Double Row), S. R. B. Improved Type Taper Roller Bearings, "Standard Chrome Alloy" Steel Balls, Rudge-Whitworth Detachable Wire Wheels

S. R. B. ANNULAR BALL BEARINGS

It is a fact and has been proven by conclusive tests for strength and endurance that **S. R. B. Bearings** are superior to any bearings made in America.



There are three fundamental principles upon which we base this claim of superiority, namely:

- 1st. Accuracy of chemical composition of the steel used in their manufacture.
- 2nd. Accuracy of heat treatment which produces the correct physical structure in the steel.
- 3rd. Accuracy of mechanical execution in the grinding and fitting of all the component parts.

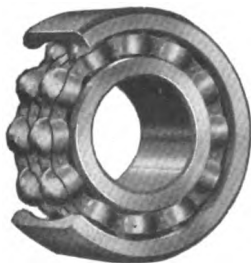
We stand ready to prove these assertions.

S. R. B. Maximum Silent Type Annular Ball Bearings are so called because no other name is so appropriately descriptive; maximum, because they contain the greatest number of balls possible to put into a bearing of this type; silent, because they are positively noiseless.

They are capable of sustaining greater thrust loads than other annular ball bearings because of four specific points of merit in their design and workmanship:

- 1st. Deep ball groove in races.
- 2nd. Large diameter balls.
- 3rd. Maximum number of balls.
- 4th. Accurate and snug fitting assembly.

S. R. B. Bearings are interchangeable with all other makes of annular ball bearings, either domestic or foreign; comparative table (form 9032) showing the most commonly used sizes will be sent upon request.



It has been frequently demonstrated that under some conditions one type of bearing works a tremendous saving over another. Certain other conditions sometimes develop which make one type of bearing impracticable for the use intended. Under certain load conditions, a smaller bearing can be used very often with the same satisfaction and service as the larger one. Sometimes by making a slight change in application, according to the bearing maker's point of view, greater efficiency can be obtained.

STANDARD ROLLER BEARING CO.

You will find us always ready to solve such problems without bias and without charge, and we particularly urge the importance of consulting our Engineering Department in selecting bearings for any mounting. You will find our engineers qualified by training and experience to give expert advice on such problems, and by submitting your plans to us, sending if possible blueprints or sketches showing the application and giving complete information regarding speed, load and shaft size, you can be assured that most satisfactory results will be obtained.

S. R. B. Bearings are made to do their work with masterful efficiency.

S. R. B. Improved Type Taper Roller Bearing

We have designed, tested and are now manufacturing Taper Roller Bearings in accordance with an improved scheme of construction representing a radical departure as regards shape of rollers and cone from the design of any bearing which has so far appeared on the market. This improved bearing possesses these advantages:



1. The parts are simpler to manufacture, so that they can be gauged very accurately and all the component parts of the bearing are more nearly interchangeable than it has before been considered possible to make.

2. When constructed of the same quality of steel as the same size bearing of a competitor's manufacture, the new design will display four times the endurance and life which the other designs can yield. But when constructed of our superior analysis and correctly heat-treated steels, the load-sustaining capacity of our new design bearing is still further improved.

3. This improved bearing while under load requires the application of one-quarter or one-fifth the torque to set the bearing spinning. This is also an indication of the relative frictional resistance of the new and old type bearings.

4. The primary elements of this improved type bearing are of such liberal design and the rollers and cone being contained as one unit, thus attaining simplicity of adjustment, that it commends itself to all who desire to avoid common bearing troubles, resulting in putting a bearing out of commission long before wear or abuse would have brought total incapacity.

"STANDARD CHROME ALLOY" STEEL BALLS

The increasing use of steel balls for anti-friction Bearings has created a demand for balls of the greatest crushing strength combined with durability and great accuracy. After exhaustive investigations on the subject of alloy steels and the effects of various heat treatments on such steels, we are offering our Standard Chrome Alloy Steel Balls, which by actual tests have been shown to have a crushing strength approximately $33\frac{1}{3}\%$ greater than that of the best foreign balls of equal size. Standard Chrome Alloy Balls are made from a special chrome alloy steel, made exclusively for us and particularly adapted for the service to which these balls are subjected. The greatest care is exercised in the various processes of manufacture, including the heat treatment and inspection. Standard Chrome Alloy Balls are gauged three times as to their accuracy in diameter and sphericity before shipment, and are guaranteed to have a commercial accuracy of within .0001". Their surfaces are absolutely free from any tool marks or flaws in material.

U. S. BALL BEARING MFG. CO.

(Conrad Patent Licensee)

PALMER ST. AND KOLMAR AVE., CHICAGO, ILL.

Manufacturers of Strom Bearings



BALL BEARINGS

*of all types and sizes to operate
under any condition of load and speed.*

STROM Radial Bearings Deep Groove Type

Made in any size for light, medium or heavy duty; with deep groove ball races accurately formed, in which large sized balls, separated by a light and sturdy retainer, roll true with the least friction. They are especially adapted above all others to sustain large radial loads under severe operating conditions. They are capable of resisting end thrust loads equal to 50% of their available radial capacity.

STROM Angular Contact Bearings

Made in the same sizes and interchangeable with the radial bearings. They are of similar construction to the radial bearings, being especially designed to support combinations of radial and heavy end thrust loads acting in one direction. They have an end thrust capacity equal to 150% of their available radial capacity.

STROM Thrust Bearings

Made in all types and sizes with flat and grooved races to meet all conditions of speed and thrust loads acting in one or two directions, and compensating for misalignment. They are of the same typical sturdy construction for which STROM bearings are noted and are especially adapted to sustain exceptionally large thrust loads.

Engineering Service

Our Engineering Department comprises a staff of ball bearing experts, and is always at your service. It is our desire that if at any time they may be of service to you, and help you to solve your bearing problems, you will feel at liberty to call upon them.

Any of the following publications gladly furnished on request:

- STROM BEARINGS catalogue.
- STROM BEARINGS S. A. E. Data Sheets.
- Lubrication of Ball Bearings pamphlet.
- Limits and Allowances on Shafts and Housings.
- Calculating Bearing Loads.
- Bulletins on Special Applications.

ATLAS BALL COMPANY

GLENWOOD AVENUE AT FOURTH STREET

PHILADELPHIA, U. S. A.

Manufacturers of Steel Balls for Bearings

ATLAS STEEL BALLS

Accuracy

Uniformity

Quality

ATLAS BALLS are the recognized standard steel bearing balls of American manufacture, and the peer of any bearing ball in the world. Our constant efforts to perfect a product that our guarantee could cover without any exceptions have been appreciated by ball bearing, automobile and high grade machinery manufacturers who are the acknowledged leaders in their respective fields.



We have met the demand for a perfect ball—the Atlas process of grinding insures round balls of uniform accuracy.

The balls go through a process which includes forging, three stages of grinding, annealing, hardening and polishing, the nature of which produces balls of uniform cross-section, *hard clear through*, and absolutely accurate within .0001 of an inch.

We make one grade of balls only—the highest—and confine ourselves to that grade.

Chrome Alloy Steel of special analysis is used in making Atlas Balls. This steel is hardened clear through and is the very highest quality that can be used.



Atlas Balls stand the test of time, wear and of every known formula for determining quality and exactitude.

IMPORTANT

We guarantee accuracy to within one-tenthousandth of an inch to size. Every box is sealed and the contents will be found to be as represented.



THE GWILLIAM COMPANY

Engineers

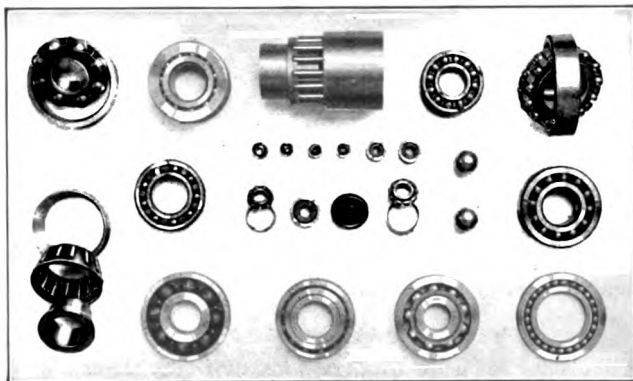
NEW YORK: 253 W. 58TH ST. AT BROADWAY

'PHONE: COLUMBUS 8356

PHILADELPHIA: 1314 ARCH ST., 'PHONE: WALNUT 3497

BALL AND ROLLER BEARINGS

English (Inch) and Metric Dimensions
All Types of Bearings in Stock or To Order



Annular Ball Bearings
(English Ball Journal)
Single and Double Row

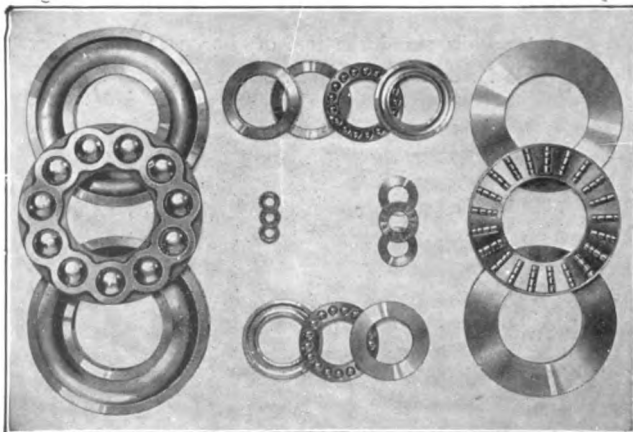
Ball Thrust Bearings
All Types

Journal Roller Bearings

Taper Roller Bearings

Roller Thrust Bearings

Pressed Steel Bearings
All Types



THE G WILLIAM COMPANY

Sole U. S. Distributors for Bowden Wire, Ltd., England

NEW YORK: 253 WEST 58TH ST.

PHILADELPHIA: 1314 ARCH ST.

BOWDEN PATENT WIRE MECHANISM

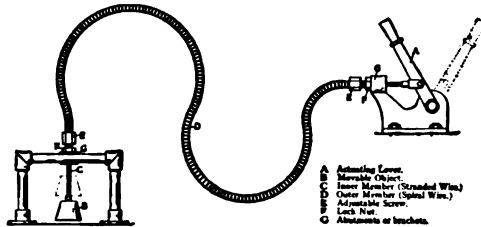
Consists mainly of two parts, a closely coiled and practically incompressible spiral wire forming a FLEXIBLE TUBE, termed the OUTER MEMBER, and a practically inextensible Special wire cable (Flexible) threaded through the above and termed the INNER MEMBER.

What It Does: The Bowden Wire Mechanism dispenses with all the difficulties of the usual mechanical method of transmitting power in other than a straight line, while enabling power to be transmitted by a tortuous route. The Mechanism is complete in itself, and requires only that one member shall be anchored to a stop at each end, and that the other member shall be attached to an operating lever at one end and to the object to be moved at the other.

There are two styles of finish:

BOWDENSOLO, in which the outer member is tinned.

BOWDENITE, is of the same construction but is in addition covered with a weatherproof material, and is superior for exposed installations.



The Principle Illustrated



Bowdensolo



Bowdenite

OUTER MEMBER				INNER MEMBER	
(Order by number)		Approximate Dimensions of Bowdensolo		(Order by size)	
Bowdenite	Bowdensolo	Bore	Outside	Diameter in fraction of inch	
11	31	.093	.163 or .145	$\frac{1}{16}$	
12	32	.123	.193	$\frac{3}{16}$	
13	33	.138	.220	$\frac{1}{8}$ or $\frac{3}{16}$	
14	34	.169	.251	$\frac{9}{16}$	
15	35	.195	.290	$\frac{11}{16}$	
16	36	.225	.320	$\frac{13}{16}$	
51	71	.066	.136	$\frac{1}{32}$ or $\frac{1}{16}$	
	300	.087	.182		
	301	.186	.250		
	302	.250	.320		
	303	.250	.332		
	304	.234	.316		

ADAPTED THROUGHOUT THE WORLD TO

Airship and Aeroplane Controls
 Auxiliary Air Regulators for Gasolene Motors
 Brakes for Cycles, Motor Cycles, Cycle Cars and Motor Cars
 Brakes for Elevators
 Brakes for Military and other Heavy Vehicles
 Brakes for Trailed Vehicles
 Carburetor Ticklers
 Change-Speed Gears for Cycles, Cycle Cars and Motor Cars

Controls for Electric Switches
 Handle-Bar Control for Motor Cycles
 Ignition and Throttle Control for Motor Cars and Motor Cycles
 Locking Devices for Elevator Gates
 Motor Boat Controls
 Muffler Cut Outs
 Sighting Mechanism for Naval Guns
 Sprags for Motor and other Vehicles
 Valve-Lifters for Motor Cycles
 Wireless Telegraphy Switchboards and many other Mechanical Devices

Extensively Used in the American, British, French and Italian Navies and Aircraft

DETROIT OAK BELTING CO.

DETROIT, MICH.

ATLANTA, GA.
1518 Hurt Bldg.

AGENTS THROUGHOUT
UNITED STATES

CLEVELAND, O.
4 Wade Bldg.

Manufacturers of Leather Belting

FIRST QUALITY—OAK TANNED—REGULAR CEMENT



Center portion only of high grade belting butts tanned to our own specifications. Made for general heavy service.

Single 16 to 18 oz. Double 29 to 33 oz. Extra heavy. Double 34 to 36 oz. 3 ply 46 to 48 oz.

Double thickness $\frac{3}{8}$ " to $\frac{1}{2}$ ". 3 ply $\frac{1}{2}$ " to $\frac{5}{8}$ ".



Medium weight. Recommended for general high speed service where heavy belt is not required. Single 14 to 15½ oz. Double 26 to 28 oz. 3 ply 42 to 45 oz. Double thickness $\frac{1}{8}$ " to $\frac{1}{4}$ ". 3 ply about $\frac{1}{2}$ " thick.



Reg. U. S. Pat. Office

Light weight. Recommended for small pulleys.

Single 12 to 13½ oz. Double 22 to 25 oz.

Double thickness $\frac{1}{4}$ " to $\frac{1}{2}$ ".

Used principally in double not over 12" wide.

SECOND QUALITY—OAK TANNED—REGULAR CEMENT



Heavy



Medium



Light

SHORT LAP, moderate price belting made of selected side stock carefully stretched and curried.

"NAIAD"—FIRST QUALITY—WATER-PROOF

GUARANTEED



Reg. U. S. Pat. Office

ALL WEIGHTS
AND SIZES



THE GRATON & KNIGHT MFG. CO.

WORCESTER, MASSACHUSETTS, U. S. A.

Oak Leather Tanners and Belt Makers

Atlanta, Ga.
Boston, Mass.
Chicago, Ill.
Cleveland, O.

Detroit, Mich.
Fall River, Mass.
Kansas City, Mo.
Minneapolis, Minn.

New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.

Portland, Ore.
St. Louis, Mo.
Seattle, Wash.
Leicester, England

Graton & Knight Mfg. Co. of Texas,
Dallas, Tex.

Graton & Knight Mfg. Co. of Wisconsin,
Milwaukee, Wis.

Graton & Knight Mfg. Co. of California
San Francisco, Cal.

LEATHER—LEATHER BELTING, FLAT, ROUND, TWIST & "V"

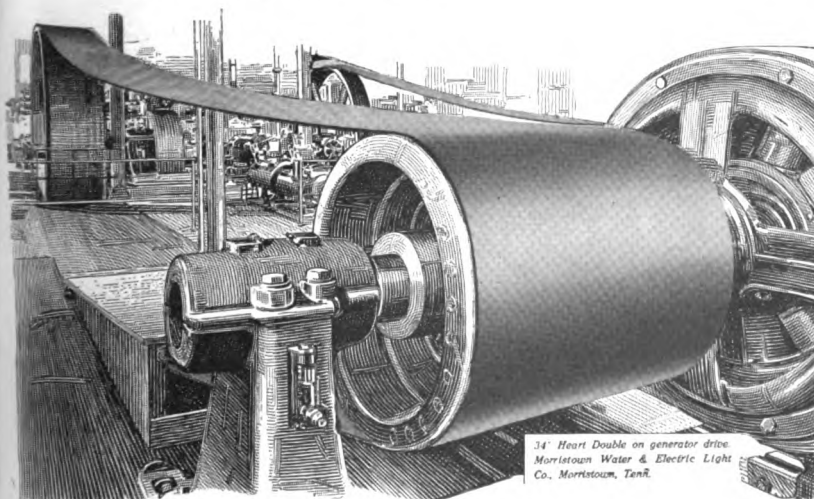
LACE LEATHER—BELT CEMENT—BELT DRESSING—PACKING

STRAPPING—AUTOMOBILE LEATHERS

STANDARDIZED SERIES LEATHER BELTING

A complete series of leather belting brands, each built on the *basis of the work to be done*. Each Brand is thus suited for the most economical transmission of power for the drive on which it is placed. This series includes belts of all weights constructed from carefully selected stock prepared especially for belting in our own Tannery. This insures absolute uniformity and unvarying strength, weight and wearing qualities in the finished belt. These belts have become the standard of quality through years of successful operation on drives of every description.

Our Engineering Department will gladly investigate or design any power transmission system or particular drive upon request. Let our Engineers co-operate with you.



14' Hout Double on generator drive
Morristown Water & Electric Light
Co. Morristown, Tenn.

J. E. RHOADS & SONS

MAIN OFFICE: 12 NORTH THIRD STREET, PHILADELPHIA

NEW YORK

CHICAGO

BALTIMORE

WILMINGTON

Manufacturers of Leather Belting, Flat and Round, Leather Belt Preserver
Tanners of Tannate Belting Leather and Tannate Lace Leather



RHOADS LEATHER BELTING

In Rhoads Belts you find strength and durability that are hard to equal. This saves you break-downs and loss from stoppage. They show comparatively little stretch, and are unusually true and even balanced. It is sold on the standard flat belt list.

TANNATE LEATHER BELTING

In Tannate Flat Belting you find the above advantages, plus the remarkable toughness given by our Tannate tannage. Tannate takes strong grip on the pulley, reducing slippage to the lowest terms. It has remarkable power of resisting heat. Sold on standard flat belt list.



LEATHER BELTING PRICE-LIST ADOPTED NOVEMBER 21, 1906

Prices per Running Foot

1/2 in. \$.12	3 1/2 in. \$.78	11 in. \$2.64	21 in. \$5.04	40 in. \$ 9.60
5/8 "15	3 3/4 "84	12 " 2.88	22 " 5.28	42 " 10.08
3/4 "18	3 1/2 "90	13 " 3.12	23 " 5.52	44 " 10.56
7/8 "21	4 "96	14 " 3.36	24 " 5.76	46 " 11.04
1 "24	4 1/2 " 1.08	15 " 3.60	25 " 6.00	48 " 11.52
1 1/4 "30	5 " 1.20	16 " 3.84	26 " 6.24	50 " 12.00
1 1/2 "36	5 1/2 " 1.32	17 " 4.08	27 " 6.48	52 " 12.48
1 3/4 "42	6 " 1.44	18 " 4.32	28 " 6.72	54 " 12.96
2 "48	6 1/2 " 1.56	19 " 4.56	30 " 7.20	56 " 13.44
2 1/4 "54	7 " 1.68	20 " 4.80	32 " 7.68	60 " 14.40
2 1/2 "60	8 " 1.92		34 " 8.16	64 " 15.36
2 3/4 "66	9 " 2.16		36 " 8.64	68 " 16.32
3 "72	10 " 2.40		38 " 9.12	72 " 17.28

Double Belts List at Twice the Price of Single.

TANNATE ROUND BELTING

For twenty odd years Tannate Round Belting has been outlasting ordinary belts from two to five times. Its remarkable grip permits easy drives, and its extreme strength gives unusual durability. It saves you take-ups and repairs. For clothing and shoe factories, it has all competitors beaten. It costs less in the long run.

PRICES ON TANNATE ROUND BELTING

Revised October 25, 1917

In not less than	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2
1000 ft. lots											
Per 1000 ft.	33.00	39.00	44.30	46.60	47.30	60.00	78.85	103.75	141.30	164.90	197.80
500 ft. lots											
Per 500 ft.	3.50	4.25	4.50	4.75	5.00	6.35	8.00	10.75	14.95	17.20	20.40
100 ft. lots											
Per 100 ft.	3.75	4.50	4.65	5.15	5.25	6.60	8.50	11.45	15.70	18.10	21.15
Per foot	5 1/4c	5 1/2c	6c	6 1/4c	6 1/2c	8 1/2c	9 1/2c	13c	17c	20 1/2c	25c

The above prices are made only when the quantities specified are ordered for shipment at one time.

The quantities may be made up of different sizes. These prices are strictly net.

J. E. RHOADS & SONS



TANNATE LACE LEATHER

Tannate Lace Leather lasts from three to five times as long as ordinary rawhide. It keeps tough and flexible, and it does not break until it wears out. It saves you labor of lacing and the labor costs more than the lace. It increases output and costs less per year.

PRICES ON TANNATE LACE

Revised October 25, 1917

TANNATE CUT LACING

	$\frac{1}{4}$ in.	$\frac{3}{16}$ in.	$\frac{1}{2}$ in.	$\frac{5}{16}$ in.	$\frac{1}{2}$ in.	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.
In 1000 Ft. lots, per 100 ft.	2.40	2.85	3.35	3.80	4.40	5.40	6.55
In 500 Ft. lots, per 100 ft.	2.45	3.00	3.45	4.10	4.50	5.75	6.85
In 100 Ft. lots, per 100 ft.	2.60	3.15	3.60	4.25	4.75	6.00	7.20
Less than 100 Ft., per ft.	4 $\frac{1}{4}$ c	4 $\frac{1}{2}$ c	5c	5 $\frac{1}{2}$ c	6c	7 $\frac{1}{2}$ c	7 $\frac{3}{4}$ c

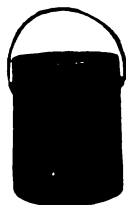
TANNATE LACE IN BACKS

Less than $\frac{1}{2}$ dozen, at 88c per sq. ft.

$\frac{1}{2}$ dozen and over, at 82c per sq. ft.

The above prices are made only when the quantities specified are ordered for shipment at one time. The quantities may be made up of different sizes. These prices are strictly net.

239



RHOADS LEATHER BELT PRESERVER

There is an ancient belt that has driven a Pennsylvania flour mill since 1882. This belt owes its green old age to having been treated with Rhoads Preserver for more than 20 years. Rhoads Preserver is highly beneficial to leather. It keeps belts pliable and strong, and gives them the hug and grip that promote maximum output. It reduces your belt bills.

NET PRICES

10 lb. cans
25 lb. cans

at 42c per lb.
at 40c per lb.

50 lb. cans
Barrels and half barrels

at 35c per lb.
at 32c per lb.

RHOADS STICK BELT DRESSING

For belts that slip because of excessive load or other unusual conditions, use Rhoads Stick Belt Dressing. It promotes flexibility and gives a grip that keeps down slippage.

NET PRICES

1-lb. sticks at 40c each
1 doz. 1-lb. sticks at 37 $\frac{1}{2}$ c each
50 1-lb. sticks at 35c each
3-lb. sticks at \$1.10 each
50 3-lb. sticks at \$1.00 each



CHAS. A. SCHIEREN COMPANY

MAIN OFFICE: 30-38 FERRY ST., NEW YORK CITY

OAK LEATHER TANNERIES:
BRISTOL, TENN.

BELTING FACTORY:
NEW YORK

Tanners and Manufacturers of Leather Belting of All Kinds, Belt Cement, Belt Dressing, Rawhide Rope. Lace Leather and Hydraulic

Branches and Stocks located in Atlanta, Boston, Chicago, Cleveland, Denver, Detroit, Kansas City, Memphis, Philadelphia, Pittsburgh, Salt Lake City, Seattle, St. Louis, Dallas. Agents in all large cities, and in foreign countries.



Our line of products includes the following:
"DUXBAK" Leather Belting, a specially processed, oak bark-tanned leather belting which is proof against water, steam, machinery oils and acid fumes. This is the largest selling brand of belting in the world. It is suitable for use anywhere under the most severe service conditions.

"BULL'S HEAD" Leather Belting, oak bark-tanned, heavy weight in all sizes for large drives where there is no moisture.

"ROYAL EXTRA" Leather Belting, oak bark-tanned, regular weight, but not waterproof. A-1 grade in every particular.

PERFORATED Leather Belting
LINK Leather Belting
ROUND Leather Belting
Cut Lacing
Lace Leather

Hydraulic Leather
Belt Cement
Belt Dressing
Packing, Hydraulic
Rawhide Rope
Leather Specialties



FACILITIES

Our tannery is located at Bristol, Tennessee, in the heart of a great oak bark section, and its capacity is sufficient to keep the factory at New York supplied at all times with oak bark-tanned leather for all grades of Schieren Beltings.

Branches and stocks located in many of the principal cities assure promptest shipment and quickest delivery of orders to belt users in any section of the country.

Chas. A. Schieren Company SERVICE

We will be pleased to figure on your requirements in our line. Literature will be furnished and prices quoted upon request.

In order that you may have full benefit of our fifty years' experience in the business, and that we may feel justified in placing our full guarantee upon the belts, we request that in every instance possible you give us full details of the design of the drive and particulars of the service expected. Specially printed blanks for this purpose will be furnished free upon request.



SHULTZ BELTING COMPANY

ST. LOUIS, MO., U. S. A.

BRANCH: 111 Chambers Street, NEW YORK

Manufacturers of Shultz Sable Rawhide Belting, Aqua Waterproof and Steamproof Belting, Oak Tanned Belting, Belt Dressing, Lace Leather, Etc.

SHULTZ SABLE RAWHIDE BELTING

Shultz Belting is made from the heaviest Packer Steer Hides, and the reason why this belting excels all others is because the leather is tanned by our own special process, and prepared from the raw material to the finished product under our own personal supervision.

SABLE Rawhide Belting is tanned on the surface—for contact, and the interior is rawhide—for strength. This, combined with its great strength and pliability, enables SABLE to hug the pulleys closer, transmit 25% more power, increase your production and outwear any oak tanned belt.



This Is Easily Done with Sable Belting of Double Thickness

SHULTZ AQUA BELTING (Chrome Tan)

AQUA is an absolute Waterproof and Steamproof Leather Belt. It is intended for laundries, dye houses, bleacheries, damp climates or any place where wet conditions exist.



Reg. U.S. Pat. & Off.

Now here is where "Aqua" is different from other types of so-called waterproof belts. The waterproofing is tanned right in. It's waterproof on the surfaces and it's waterproof in the middle and remains waterproof under the worst conditions. You can boil a double in live steam and the plies will not separate or the leather lose its strength or pliability.

"Aqua" will outlast any rubber or canvas belt ever made and transmit from 25% to 33% more power.

Test Out

A SABLE Rawhide or AQUA Waterproof Belt on a 60-day "try-it-before-you-buy-it" basis. That is a mighty fair proposition, and it gives you an opportunity of letting your eyes be the judge, and your money the last thing you part with.



TRADE MARK

Write for catalogue No. 11.

THE B. F. GOODRICH RUBBER CO.

AKRON, OHIO

Representation Everywhere

BELTING

TRANSMISSION BELTS—Main drives require the best quality. Weight and weave of duck, amount of stretch in service, and character of cover should be considered. We recommend the following grades:

"Commander"—friction-surface, gum cushion under first ply, extra quality for extreme service conditions.

"Pilgrim"—regular rubber covered, heavy duck, good friction and cover; for general service.

"Marathon"—a friction-surface belt of highest quality, built on special woven flexible duck—for small pulley, high-speed work.

Light drives, such as agricultural service, are well met by our **"Rob Roy,"** and **"Signal."**

"Commander" and **"Oilfield Stitched"**—for all conditions of service in the oil fields.

CONVEYOR BELTS for conveying ore, coal, rock, etc., call for special qualities in the belt that have taken years of practical experience to develop. A duck of maximum strength and extreme flexibility, a strong friction, a wear-resisting cover which will remain pliable, and an edge armored against chafing are all required. We offer the following grades:

"Goodrich Dredge"—for the hardest conditions known to conveyor belt practice.

"Longlife"—for severe service, where extreme wear and economy are desired.

"Maxecon"—for ordinary service; medium priced, but reliable and serviceable.

"Cossette" Belt—one of exceptionally high quality throughout, for handling cossettes in beet sugar factories.

"Whitecover" Canning Belt—special white sanitary cover for food-canning factories.

Grader Belt—recommend **"Maxecon"** with $\frac{1}{4}$ or $\frac{1}{2}$ inch top cover.

For **GRAIN ELEVATOR BELTS** we offer the following:

"Carigrain"—horizontal carrier belt.

"Legrain"—bucket-leg belt.

ELEVATOR BELTS for mines and quarries require a duck of extra strength, quality and weight to resist the tensile strains and the action of the bucket bolts. We use a special, heavy duck and recommend the following belts:

"New Mining" Elevator Belt—special high grade for most severe service, recommended for mine elevators. Furnished with either friction surface or highest grade brown cover.

"Akron"—high grade, designed for hard duty.

"Cost Cutter"—designed for general conditions but has operated satisfactorily in hard service.

"GOODRICH AXLE LIGHTING" belt meets the severest service known—that of electric train lighting from the car axle.

POLISHING BELTS—sometimes called Emery Belts; built on especially strong fabric with high quality, tough friction.

We are also prepared to furnish Magnetic Take-Off Belt, Separator Belts, etc.

THE ROSSENDALE-REDDAWAY BELTING & HOSE COMPANY

NEWARK, N. J., U. S. A.

Manufacturers of "Camel Hair" Belting, "Arabian" Hair Belting, "Black Bird" Solid Woven Belting, Bird's Bull's-Eye Belting, "Sphinx" and "Bengal" Brands of Stitched Canvas Belting

"CAMEL HAIR" BELTING



Reg. U. S. Pat. Off.

For Power Transmission.

This belt is remarkable for its great strength (almost twice that of the leather belting), long life, small slippage, minimum stretching, straight true running, and for the fact that it is less affected by dampness or acid fumes than any other kind of belting. This belting is also sold under a guarantee that it will give longer, better service than any other style of belting running under the same conditions.

243

BIRD'S BULL'S-EYE BELTING



Reg. Trade Mark

For Power Transmission and for Conveying.

SOLID WOVEN BELTING

"Black Bird"

Reg. Trade Mark

For Power Transmission and for Conveying.

STITCHED CANVAS BELTING

"Sphinx" and "Bengal" Brands for all purposes.

BRAKE BAND LININGS

NEW YORK RUBBER COMPANY

Incorporated 1881

NEW YORK
34 READE ST.

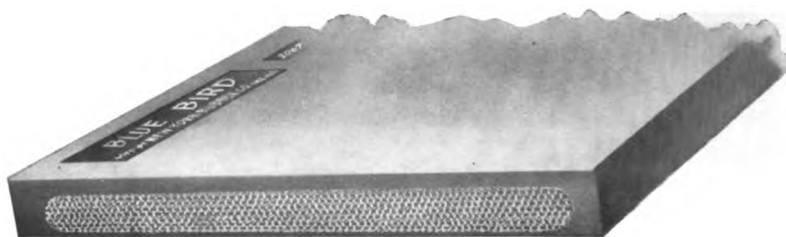
CHICAGO
325 W. RANDOLPH ST.

Manufacturers of Mechanical Rubber Goods

"BLUE BIRD" CONVEYOR BELT

LOW PRODUCTION cost means higher salaries

We GUARANTEE its ECONOMY



Other Brands: "Gold Dredge," "Stonore," "Dependable." Stonore and Dependable made with special covers for varying service conditions.

TRANSMISSION BELTS

Triumph: Friction surface. Fancy belt for permanent installation where initial outlay is not deciding factor.

Wiccapée: Friction surface. Recommended for main and important counter drives. *It has stood the test of Time.* Its installation insures economical transmission.

Our Extra: Friction surface. A good belt for ordinary service.

Other Brands: "Tractor," Friction Surface; "Elevator Special;" "Dutchess Stitched;" "Stacker;" "Cameo" and "Clinton" brands.

We also make hogscraper belts, axle generator belts, as well as special belts for any particular service.

NEW YORK RUBBER COMPANY

"BLUE BIRD" AIR HOSE

No Wire to Remain Crushed



The celebrated ROPERAP construction with the abrasion resisting "BLUE BIRD" cover. Its wearing qualities insure ultimate economy.

ROPERAP PNEUMATIC HOSE

Illustration above serves to show construction. An economical hose for pneumatic tool service.

The "Dutchess" and "Cameo" brands made in the multiple construction.

STEAM HOSE

"Roperap" Steam Hose has the advantages of armored hose of the ordinary construction without any of the drawbacks of wire winding. Recommended for severe service.

The "Dutchess" brand—a good hose for regular service.

WATER HOSE

Rubber Fire Hose—"Blue Bird" brand. This hose carries the usual fire hose guarantee.

The "Dutchess" brand for the heavier pressures.

"Cameo" brand recommended for lighter service.

RUBBER PACKINGS

Of all kinds and for all uses.

CRESCENT BELT FASTENER CO.

381 FOURTH AVENUE, NEW YORK CITY

BRANCHES: BIRMINGHAM, ENGLAND; TORONTO, CANADA

Distributors throughout the World

Manufacturers and Patentees of the Genuine Crescent Plates and Crescent Rivets for Joining All Kinds and Makes of Belts of Every Width and Thickness

CRESCENT BELT FASTENERS

The Original Plate and Rivet Type of Belt Fastener For Joining Transmission, Elevating and Conveying Belting

Universally used on all open drives, quarter turn, half turn and cross belt drives. Made in a range of sizes to completely cover every belting service from light, high speed up to and including extremely heavy duty.

Crescent Belt Fasteners are quickly and easily attached. Anybody who can use a hammer can make a perfect Crescent joint. No machine is required. No punches. No tools. No particular knack or skill. Minimum time is required. The Crescent method is practically "Foolproof."

A Crescent joint once made is there to stay. It never requires attention. It insures continuous, uninterrupted service. It is an actual reinforcement of the belt at the joint. Crescents eliminate the damage done to belting by joint failures and the consequent necessity for rejoining; they actually prolong the active life of the belt.

Crescent Belt Fasteners require no punched holes. Instead of removing material and weakening the belt at the joint they strengthen it.

246

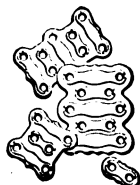


Crescent Plates are used singly on narrow belts and in multiple to cover larger belt widths. Note how the butt ends are brought tightly together, making the belt endless on the pulley side for all practical purposes.

A good belt can give the service its quality and cost warrant only if the joint is as good as the belt. The mechanic on the job can take 25% to 50% of the life and strength of the best belt made by using inefficient joining methods.

Crescent Belt Fasteners are the solution of the belt joining problem worked out in accordance with the best modern engineering practice. A Crescent joint holds until it is taken apart.

A Crescent-made joint is *safe*. As the ends are brought tightly together there is no unevenness to catch hands or clothing. No prongs or sharp points to tear clothes or flesh. Nothing can work loose or fly off.



Crescent Plates

Crescent Plates are practically indestructible; and, since one-half the Crescent Rivets are preserved when shortening a belt the Crescent method is the most economical. Crescent Belt Fasteners do away completely with breaking joints and soon pay for themselves many times over in time and labor saved. When joined with Crescents a belt can be easily and quickly disconnected or shortened. The Crescent Rivets are removed from one side only of the joint, leaving the Crescent Plate attached to the other end. The Slack is then cut off and the belt rejoined with a new row of Crescent Rivets.



Crescent Rivets

CRESCENT BELT FASTENER CO.

Crescent Plates combine exceptional strength with light weight. Being curved to conform to the pulleys they give the utmost power transmission.

Crescent Rivets are double pronged, of special construction and special metal and designed especially for attaching Crescent Plates. Crescent Rivets are self-piercing; require no punched holes; remove no material; do not weaken the belt in any way. When clinched on the pulley side the prongs of Crescent Rivets embed themselves in the material so that no metal touches the pulley.

Every Crescent Plate and Crescent Rivet is marked with our registered trade name "Crescent." For your protection see that the name "Crescent" is specified on all orders.

SERVICE CHART—CRESCENT BELT FASTENERS

For all kinds and makes of belting of every length, width and thickness

LIGHT WORK Pulleys 3 Inch or Larger Belting ¾ inch to 4 inches wide.	For ¾ & 1 inch of belt width, No. 25	CRESCENT SHORT GRIP PLATE, \$2.88 Per Gross
	" 1½ " " " " " 45	" " " " " 5.76 "
	" 2 " " " " " 65	" " " " " 8.64 "
	" 2½ " " " " " 85	" " " " " 11.52 "
	" 3 " " " " " 805	" " " " " 11.52 "
GENERAL WORK Pulleys 6 Inch or Larger Belting 1½ inches to 8 inches wide.	For 1½ inches of belt width, No. 67	CRESCENT MEDIUM GRIP PLATE, \$8.64 Per Gross
	" 2 " " " " " 607	" " " " " 8.64 "
	" 2½ " " " " " 87	" " " " " 11.52 "
	" 3 " " " " " 107	" " " " " 14.40 "
	" 3½ " " " " " 127	" " " " " 17.28 "
For 4 " " " " " 147		" " " " " 20.16 "
For belting wider than 4 inches use two or more Crescent Plates of the same grip.		
GENERAL WORK Pulleys 9 Inch or Larger Belting 2 inches to 12 inches wide.	For 2 " inches of belt width, No. 63	CRESCENT SPECIAL GRIP PLATE, \$11.52 Per Gross
	" 2½ " " " " " 83	" " " " " 14.40 "
	" 3 " " " " " 103	" " " " " 17.28 "
	" 3½ " " " " " 123	" " " " " 20.16 "
	For belting wider than 3½ inches use two or more Crescent Plates of the same grip.	
HEAVY WORK Pulleys 12 Inch or Larger Belting 5 inches to 36 inches wide.	For 2½ inches of belt width, No. 109	CRESCENT LONG GRIP PLATE, \$17.28 Per Gross
	" 3 " " " " " 149	" " " " " 23.04 "
	" 3½ " " " " " 1409	" " " " " 25.92 "
	" 4 " " " " " 189	" " " " " 28.80 "
	For belting wider than 4 inches use two or more Crescent Plates of the same grip.	

Attach all the above Crescent Plates with Crescent Large Shank Rivets as follows:

For belting 2/16 inch thick use size 5/16 Crescent Large Shank Rivets \$70 Per Gross	NOTE: To determine the quantity of Crescent Rivets needed to attach a given quantity of Crescent Plates, multiply the number of gross of Crescent Plates ordered by the bold face figures of the size number of the Crescent Plate. Example: 3 gross No. 127 Crescent Plates—3x12=36 gross of Crescent Large Shank Rivets required.
" " 3/16 " " " " 6 " " " " 70 "	
" " 4/16 " " " " 7 " " " " 80 "	
" " 5/16 " " " " 8 " " " " 90 "	
" " 6/16 " " " " 9 " " " " 100 "	
" " 7/16 " " " " 10 " " " " 110 "	
" " 8/16 " " " " 11 " " " " 120 "	
" " 9/16 " " " " 12 " " " " 130 "	
" " 10/16 " " " " 13 " " " " 140 "	
" " 11/16 " " " " 14 " " " " 150 "	

HIGH-SPEED LIGHT WORK Pulleys 2 Inch or Larger	For ¾ & 1 " inch of belt width, No. 20 CRESCENT HIGH-SPEED PLATE, \$2.88 Per Gross
	" 1 " " " " " 40 " " " " 5.76 "
	" 1½ " " " " " 60 " " " " 8.64 "
	For belting wider than 2 inches use two or more Crescent Plates of the same grip.
HIGH-SPEED LIGHT WORK Pulleys 4½ Inch or Larger	For 1½ inches of belt width, No. 66 CRESCENT HIGH-SPEED PLATE, \$8.64 Per Gross
	For belting wider than 3 inches use two or more Crescent Plates of this size.

For attaching all Crescent High-speed Plates use Crescent Small Shank Rivets as follows:

For belting 2/16 inch thick use size 5/16 Crescent Small Shank Rivets \$50 Per Gross	NOTE: To determine the quantity of Crescent Rivets needed to attach a given quantity of Crescent Plates, multiply the number of gross of Crescent Plates ordered by the bold face figures of the size number of the Crescent Plate. Example: 3 gross No. 44 Crescent Plates—3x4=12 gross of Crescent Small Shank Rivets required.
" " 3/16 " " " " 6 " " " " 50 "	
" " 4/16 " " " " 7 " " " " 55 "	
" " 5/16 " " " " 8 " " " " 60 "	
" " 6/16 " " " " 9 " " " " 65 "	
" " 7/16 " " " " 10 " " " " 70 "	

EXTREMELY HEAVY WORK Large Pulleys Belting up to 72 inches wide.	For 3 inches of belt width, No. 1611 CRESCENT JUMBO PLATE, \$28.80 Per Gross
	" 4 " " " " " 2211 " " " " 34.56 "

For attaching Crescent Jumbo Plates use Crescent Jumbo Rivets as follows:

For belting 5/16 inch thick use size 10/16 Crescent Jumbo Rivets—\$1.25 Per Gross	NOTE: To determine the quantity of Crescent Rivets needed to attach a given quantity of Crescent Plates, multiply the number of gross of Crescent Plates ordered by the bold face figures of the size number of the Crescent Plate. Example: 3 gross No. 2211 Crescent Plates—3x23=69 gross of Crescent Jumbo Rivets required.
" " 6/16 " " " " 11 " " " " 1.40 "	
" " 7/16 " " " " 12 " " " " 1.55 "	
" " 8/16 " " " " 13 " " " " 1.70 "	
" " 9/16 " " " " 14 " " " " 1.85 "	
" " 10/16 " " " " 15 " " " " 2.00 "	
" " 11/16 " " " " 16 " " " " 2.15 "	
" " 13/16 " " " " 18 " " " " 2.30 "	

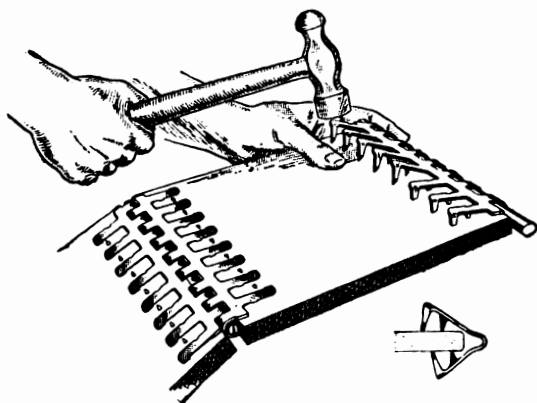
CRESCENT RIVET EXTRACTOR No. 79.....\$1.00 Each

Be sure to specify enough Crescent Rivets for attaching the Crescent Plates ordered

FLEXIBLE STEEL LACING CO.

522 SO. CLINTON ST., CHICAGO, ILL.

Manufacturers of Steel Belt Lacing and Lamp Guards



"Just a Hammer to Apply It"

"ALLIGATOR" STEEL BELT LACING Saves Time Saves Labor

The connecting bar between prongs is indented on the under side to allow it to be broken into required lengths and the use of a single section on any width of belt up to 12 inch. Each indentation separates a full staple which retains its efficiency.

248

Equip with ALLIGATOR—Now. The hinge joint is smooth on both sides alike, flexible and of extreme strength.

Gives lasting service on leather, cotton, rubber, balata or any width or thickness of machinery belting.

No delay to machine or operative, the joint made on the spot in a few minutes time.

"FLEXCO-LOK" GUARD For Incandescent Lamps

Prevents—Lamp breakage and reduces fire hazard.

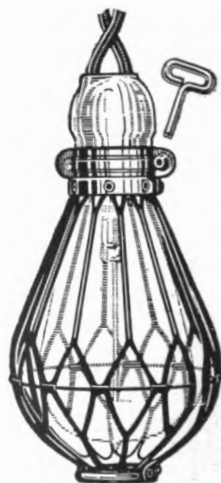
Protects—From theft.

Tested mechanical principles applied in a new manner.

Made from steel well coated with tin and is light and strong. The hinge shells close with special design key screws to a rigid grasp on the socket.

Guard lasts long, costs less than one lamp, will save you buying many lamps.

Both "Alligator" Steel Belt Lacing and "Flexco-lok" Guard reduce maintenance costs.



Catalog will be gladly sent by return mail.

THE C. O. BARTLETT & SNOW CO.

CLEVELAND, OHIO, U. S. A.

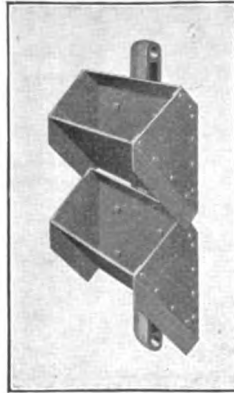
EASTERN OFFICE AT 50 CHURCH ST., NEW YORK, N. Y.

Designers and Builders of Dependable Equipment for the Handling and Preparation of Materials. Conveying and Elevating Machinery; Skip Hoists; Dryers; Crushers; Screens; Mixers

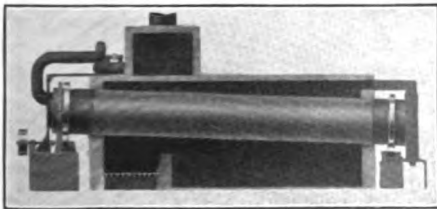


**Belt Conveyor
Handling Tempered Sand in Foundry**

Bartlett and Snow Elevating and Conveying Machinery is well fitted for all conditions which demand economy and dependability. Included in Bartlett and Snow Elevating and Conveying Machinery are: Bucket elevators and conveyors, flight conveyors, apron conveyors, belt conveyors, and screw conveyors.

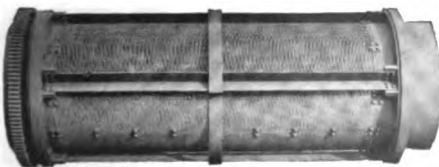


**Continuous Bucket
Elevator**

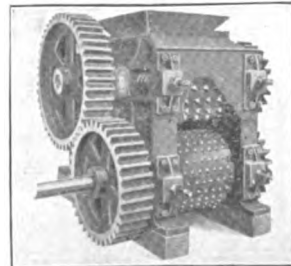


Style "D" Dryer—One of Thirteen Different Types

Bartlett and Snow Dryers comprise thirteen distinctly different types, each one of which has been developed for the proper and economical drying of a certain class of materials. Among these thirteen types there are direct fired direct heat dryers, direct fired indirect heat dryers, direct fired single pass dryers, direct fired double pass dryers, steam heated dryers, and hot air dryers.



Rotary Screens for all Conditions



Four Roll Coal Crusher

H. W. CALDWELL & SON COMPANY

17TH ST. AND WESTERN AVE., CHICAGO, ILL.

EASTERN OFFICE: 50 Church St., NEW YORK CITY
709 Main St., DALLAS, TEXAS

**Manufacturers of Elevating, Conveying and Power Transmitting Machinery;
Machinery for Handling Material in Bulk or Packages**



HELICOID "CONVEYORS"

Sole manufacturers of HELICOID SCREW CONVEYOR made of one continuous strip of metal with-

out laps or rivets. Mounted on standard and extra heavy pipe or solid shafts.

PAN, APRON AND BELT CONVEYORS

Each designed and built to handle the material for which it is best suited, to the best advantage. For COAL, COKE, SAND, CRUSHED STONE, GRAVEL, GRAIN, BOXES, BARRELS, etc.



CHAINS

Standard Malleable Iron Detachable Chain. Malleable and steel bushed chains with or without rollers. Special chains for Conveying, Elevating or Power Transmitting Purposes.

BUCKETS

We carry a large stock of standard size and weight Salem, Seamless Steel and Malleable Buckets. We are equipped to make special Buckets of all kinds to order.



CHILLED RIM SPROCKETS

The life of the Chilled Rim sprocket is from Three to Five times that of the ordinary grey iron sprocket. Traction wheels and special sprockets furnished.



GEARS

We can furnish gears with cast Teeth Machine Molded or Machine Cut. We have the most complete equipment in the country for machine molding gears. Spurs, Bevels, Miters, Worms, Worm Wheels and Mortise Wheels.

We are prepared to furnish sheet steel conveyor troughs, hoppers, elevator casings, spouting, etc.

For a complete list of our line see a copy of our No. 38 catalogue. 800 pages of useful information to every engineer, designer, plant owner or superintendent.



THE CONVEYING WEIGHER CO.

90 WEST STREET, NEW YORK, N. Y.

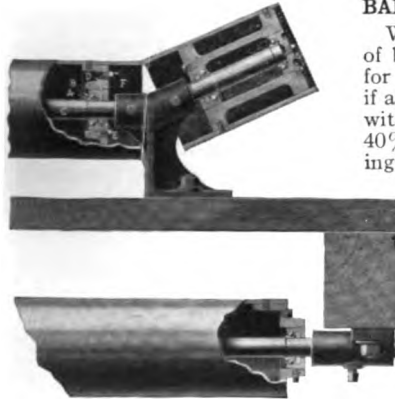
Ball Bearing Belt Conveyors; Continuous, Automatic Scales for Belt and Other Conveyors; Conveying and Hoisting Machinery; Complete Material Handling Plants; Trump Measuring and Mixing Machines; Trump Concrete Mixers

AGENCIES: HERBERT AINSWORTH, ESQ., The Corner House, JOHANNESBURG, S. AFRICA
THE A. M. ELLICOTT CO., 301 St. James Street, MONTREAL, CANADA
MR. FRANK R. PERROT, Aberdeen House, 204 Clarence St., SYDNEY, N. S. W.
MR. LUCIEN HERMANN, London Wall Bldg., LONDON, ENG.
VICTOR M. BRASCHI MACHINERY COMPANY, MEXICO CITY, MEX.
ZIMMER CONVEYOR COMPANY, 82 Mark Lane, LONDON, E. C., ENG.
J. E. ROBERTSON, Mills Bldg., EL PASO, TEX.

BALL BEARING BELT CONVEYORS

We illustrate herewith the construction of ball bearing troughing and return idlers for belt conveyors. It is guaranteed that if a belt conveyor running level be equipped with these idlers, there will be a saving of 40% in power required. These idlers having felt oil-retaining washers need to be lubricated only once in two years.

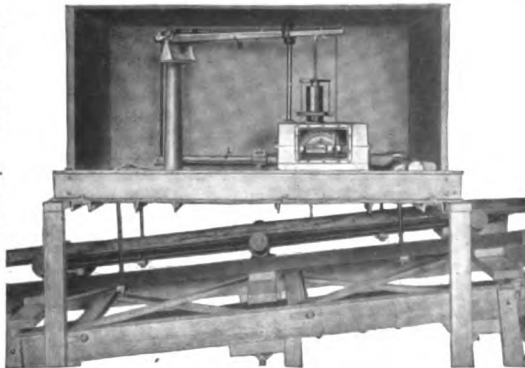
- A—Hardened steel "Cone" fitted on turned steel shaft
- B—Pressed steel "Ball Retainer"
- C—Turned steel shaft, set screwed in Idler brackets
- D—Oiled washer of felt or carded wool
- E—Hardened steel "Plug" screwed into pulley hub
- F—Brass plug for lubrication
- G—Lock screw to prevent hardened plug from turning



"Conweigh" Ball Bearing, Troughing and Return Idlers for Belt Conveyors (Patents Pending)

THE MERRICK CONVEYING WEIGHER

This device records the weight of material handled on belt conveyors, bucket conveyors, cable railways and overhead trolleys or telfers. The weigher consists of a pair of weighing levers and a steelyard of special design so that a short section of the conveyor can be suspended from the weighing levers. The extreme end of the steelyard is connected with a totalizing mechanical integrator which derives its other factor from the travel of the conveyor by means of suitable gearing from a bend pulley on the return belt, or a sprocket wheel if on a bucket conveyor. This integrator continuously totalizes the product of two quantities, one proportional to the weight of material suspended and the other to the travel of this material. The result therefore represents the total weight of material and is plainly indicated by a register.



View of Conveyor Weigher. Front Sheet of Casing Removed

C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, STATEN ISLAND, NEW YORK

New York City Office: 61 Broadway

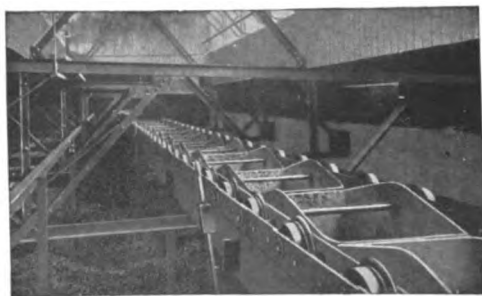
Manufacturers of Coal and Ash Handling Machinery, Pivoted Bucket Conveyors, Hoisting and Conveying Machinery, Cable and Automatic Railways, Skip Hoists, Industrial Railway Equipments, Electric Locomotives, Motor Cars, Storage Battery Industrial Trucks, Transmission and Hoisting Rope, Special Scales and Weighing Hoppers, Coal Crackers



Single Door Charging Car



Storage Battery Industrial Truck



Hunt Conveyor over Coal Bunker

INDUSTRIAL RAILWAYS AND CARS

The boiler room cars for bringing coal to boilers are so designed that the labor of firing is reduced to a minimum, and the boiler room is kept clean. We design all types of cars for use in foundries, machine shops and all kinds of manufacturing plants. The use of outside flanged wheels permits one man to push a one-ton load on a sharp curve.

Ask for catalog U 16-2 on "Industrial Railways."

STORAGE BATTERY INDUSTRIAL TRUCK

The Storage Battery Industrial Truck is designed to take the place of hand trucks, has a capacity from 2000 to 4000 lbs.; is simple and reliable.

Catalog U 16-1 on request.

PIVOTED BUCKET CONVEYORS

consist of a series of independent swinging buckets free to dump in either direction. Conveyors can run in any direction, the buckets hanging in an upright position, therefore dry or liquid material can be handled. The peculiar system of driving by a pawl relieves the conveyor wheels of all stress.



Ask for catalog U 15-4 on "Conveyors."

C. W. HUNT COMPANY, INC.

MEASURING CHUTES

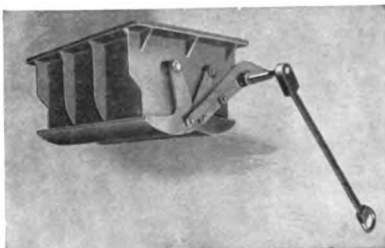
offer a method of accurately recording the volume of materials delivered. These chutes are used on locomotive coaling stations and their use results in accurate record of coal delivered to locomotive. Measuring chutes are operated by air or manually. *Catalog U 15-3.*



Air Operated Measuring Chute

HUNT GATES

for coal and ashes pockets, also for any service where the flow of materials is to be controlled. These gates are designed for easy operation—they are manufactured in various types and sizes. *Catalog U 15-3* gives full data on this subject.



24" x 36" Duplex Gate

INCLINED BOOM HOISTING ELEVATORS

are for rapid and economical hoisting of materials from vessels. The bucket, whether large or small, is carried from the hold of the vessel to the dumping place every trip in exactly the same course, and at any rapidity demanded. The bucket is carried exactly where wanted, rising vertically from the hold to the boom, running up the boom, and dumping at a fixed place.

These elevators are proportioned to suit the work and for use either with tubs or grab buckets. The lighter size is especially adapted for coal or ore hoisting, using any size bucket up to one-ton capacity.



Inclined Boom Hoisting Elevators

HUNT MOTOR CARS

Self-Dumping

made in many types, capacities up to 10 tons, and are equipped with motors and overhead trolleys or shoes for third rail as desired. Suitable for transporting coal, fertilizer materials, ores, and other bulk materials.



Hunt Motor Cars
Self-Dumping

General catalog U-102 on request.

THE LAMSON COMPANY

GENERAL OFFICES

100 BOYLSTON ST., BOSTON, MASS.

REPRESENTATIVES IN
ALL PRINCIPAL CITIES

WORKS
LOWELL, MASS. TORONTO, CAN.

Builders of Pneumatic, Selective and Mechanical Carriers and Conveyors

PRODUCTS—Pneumatic Tube Systems, Belt Conveyors, Gravity . Roller Conveyors, Selective Pick-Up and Sweep-Off Carriers, Light Elevators and Lifts, Cable and Wire Line Message and Parcel Carriers.

SCOPE OF USE—Lamson Pneumatic Carriers shoot papers, orders, mail, small tools and parts between departments and buildings. These mechanical messengers carry written orders cutting out the misunderstandings of oral messages. Quick as the 'phone, surer than the messenger boy. The ideal way to connect the planning department with superintendents, foremen and shippers.

Lamson Conveyors handle everything from tools and tote boxes to finished machines and boxed articles. They organize the whole plant so that material and partly finished parts move in an orderly stream from operation to operation.

Parcel carriers and Light Elevators convey letters, packages, letter files, blue prints in offices and drafting room. Over three hundred different kinds of business use Lamson Carriers and Conveyors.

CO-OPERATIVE SERVICE—Engineers, manufacturers, architects will find Lamson engineers ready to co-operate in solving all problems calling for carrier or conveyor systems. Lamson experience and the complete information in the hands of Lamson men enable them to solve any problem, however complicated or extensive.

LAMSON SYSTEMS—The following are the principal standardized types of carriers and conveyor systems. While standard equipment will care for almost all conditions, special systems or modified systems are designed by Lamson engineers for unusual installations.

Pneumatic Tube Systems—Consist of tubes, terminals, and carriers operated by vacuum, or pressure, supplied by special power equipment, usually a motor-driven blower. Papers, requisitions, mail, small parts, and small tools are placed in a carrier and quickly delivered to the desired point or relayed from a central point.

The installation may call for independent lines, or for a shifting current line in which two or more stations are intermittently operated by the vacuum of a single ingoing line. Or, the business may be most economically served by a Vacuo-Pressure Start and Stop System in which the motor remains idle until carrier is put into a tube at a sending point, when it automatically starts. It stops after the carrier arrives at its destination.

Pick-Up and Delivery Carriers—Traveling metal fingers or clips which move on an endless track are arranged to pick up and deliver envelopes or single sheets automatically to indicated stations.

Belt Conveyors—Used with gravity chutes and elevators. Handle boxes, packing cases, etc., raising them in a steady stream without the lost time of elevators.

Gravity Roller Conveyors—For moving boxes and any object having one flat surface. Made up of a series of ball-bearing rollers in sturdy angle-iron frames. Inclined in order to utilize gravity. Made in standard 10-foot lengths. Portable. For moving shells, pipe, shafting, the rolls are made spool-shaped.

Lamson Elevators and Lifts—Hand, pneumatic, and electrically operated. For simple, light delivery or varied heavy service.

Lamson Wire-Line Parcel Carriers—Save time in factories, stores, and commercial houses. Baskets shoot swiftly from station to station carrying merchandise, tools, etc. Car runs on wire track stretched taut between stations. Cord propulsion, or push types without propulsion for short lines. Made in Kick-Back form for one-way service—so arranged at the receiving station that the contents shoot out of the carrier into a receiver.

THE LAMSON COMPANY



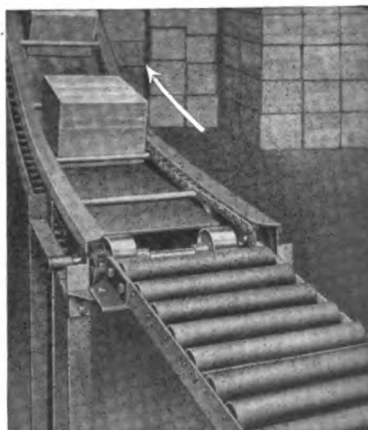
Lamson Pneumatic Tube Desk in central planning department.



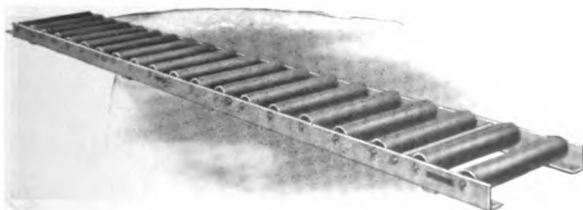
Lower end of conveyor showing boxes coming down to the shipping room.



Tools and small parts are carried at lightning speed about the machine shop or manufacturing plant.



Boxes are carried by conveyor and automatic elevator to second floor—the stream flows up hill.



Note the sturdy construction and compact appearance of this straight section of Lamson Gravity Conveyor.

LINK-BELT COMPANY

PHILADELPHIA

CHICAGO

INDIANAPOLIS

**Manufacturers of Elevating and Conveying Machinery for Every Purpose.
Power House Equipment. Power Transmission Machinery**

Original Ewart Link-Belt, >FLINT-RIM< Sprocket Wheels, Link-Belt Silent Chain Drives, Power Transmission Machinery, Pillow Blocks, Friction Clutches.

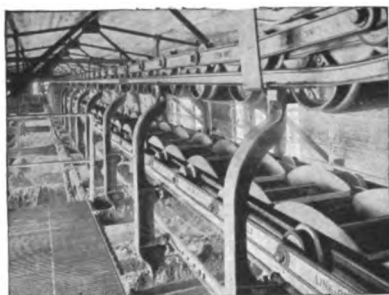
Power House Equipment: Peck Overlapping Pivoted Bucket Carriers, Belt Conveyors, Coal Bunkers, Crushers, Chutes, Telescoping Ashes Elevators, Coal Storage Systems, Traveling Water Intake Screens.

Bridge Tramways, Locomotive and Gantry Cranes, Telfers, Electric Hoists, etc. Coal Tipples, Coal Washeries, Centrifugal Coal Driers, Car Hauls, Crushers, Screens, Picking Tables, Chutes, Wholesale and Retail Coal Yard Equipment, etc.

Locomotive Coaling Stations, Cinder Stations, Complete Freight Handling Equipments.

Package Handling Machinery, Store Service Conveyors.

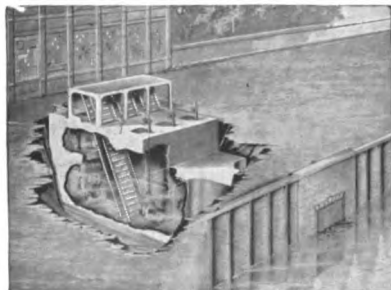
Portable Wagon and Truck Loaders, Portable Bag and Box Piling Machines.



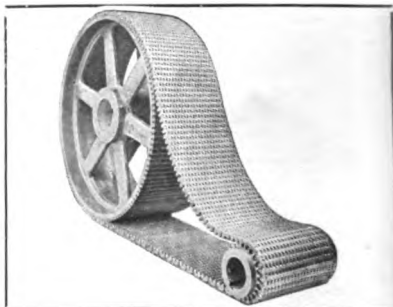
Peck Overlapping Pivoted Bucket Carrier, for Coal and Ashes



Belt Conveyor



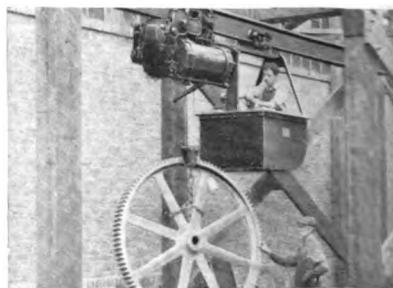
Link-Belt Traveling Water Intake Screens



Link-Belt Silent Chain



Link-Belt Locomotive Crane Storing Coal



Link-Belt Electric Hoist

ROBINS CONVEYING BELT CO.

PARK ROW BUILDING, NEW YORK

SALT LAKE CITY: Newhouse Bldg.

CHICAGO OFFICE: Old Colony Building.

SAN FRANCISCO: The Griffin Company.

BIRMINGHAM, ALA.: C. B. Davis Eng. Co., Brown-Marx Bldg.

PITTSBURGH, PA.: Union Arcade Bldg. TORONTO: Gutta Percha & Rubber, Limited

**CONVEYING, ELEVATING, HOISTING, STORAGE, RECLAIMING AND
ORE-BEDDING MACHINERY**

Robins Patent Conveyor Belt



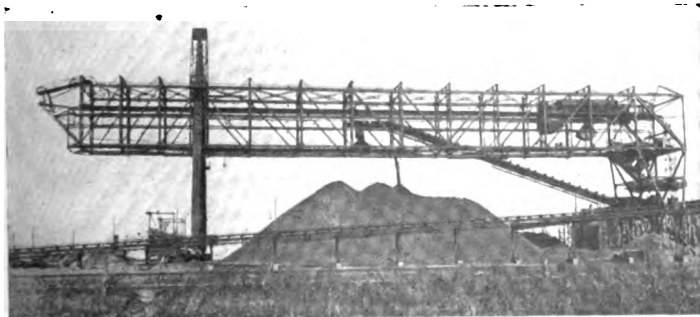
Belt Conveyors



Unloading Machinery



**Ore Bedding and Reclaiming
Machinery**



Storage and Reclaiming Machinery

Write for our "Handbook of Conveyor Practice."

WELLER MANUFACTURING CO.

GENERAL OFFICE AND WORKS

1820-1856 N. KOSTNER AVE., CHICAGO

BRANCH SALES OFFICES

NEW YORK PITTSBURGH BALTIMORE BIRMINGHAM SALT LAKE CITY SAN FRANCISCO

Designers and Manufacturers of Standard and Special

ELEVATING, CONVEYING AND POWER

TRANSMITTING MACHINERY

for

Cement Mills, Stone and Ore Crushing Plants,

Coal Handling Systems, Sand and Gravel Washeries,

Fertilizer and Phosphate Mills,

Grain Elevators and Flour Mills,

Cotton Oil and Cotton Mills,

Starch and Glucose Factories,

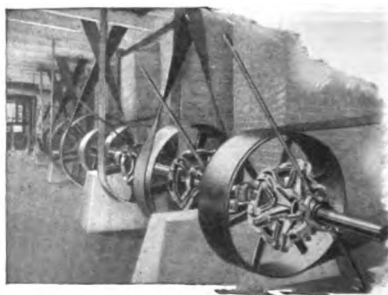
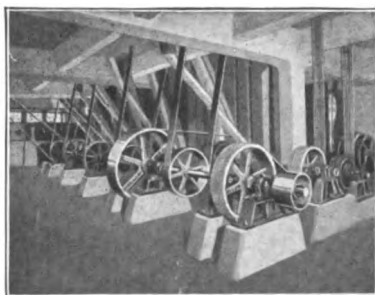
Tanneries, Brick Yards, Glass Plants,

Canneries, Paper Mills, etc.



Every member of The American Society of Mechanical Engineers should have our **General Catalogue N-35** on Elevating, Conveying and Power Transmitting Machinery.

The most complete volume ever published on this subject.

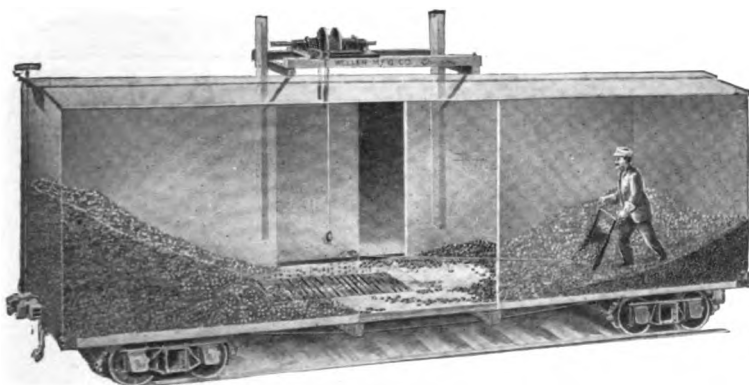


HEAVY LINE SHAFT EQUIPMENTS

Mounted on Iron Floor Stands

Every Pulley Fitted with Friction Clutch

WELLER MANUFACTURING CO.



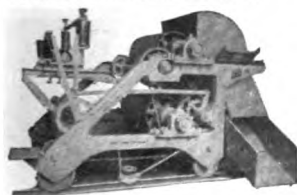
AUTOMATIC POWER SHOVELS

For unloading coal, ore, clay, sand, salt, cement, grain and other loose material



HEAVY BUCKET ELEVATORS

Up to 84" width and 36" pitch



HEAVY DUTY BELT TRIPPERS

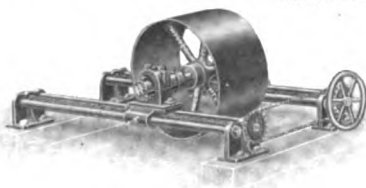


PILLOW BLOCKS

Adjustable Ball and
Socket Drop Hangers
and Pillow Blocks



HANGERS



BELT TIGHTENERS

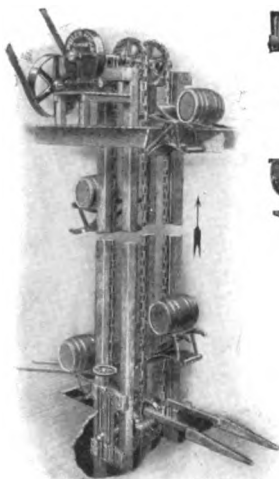


BELT CONVEYORS, 10" to 60" wide

(Continued on next page)

(Continued from preceding pages)

WELLER MANUFACTURING CO. CHICAGO



BARREL OR SACK ELEVATOR
Elevates and lowers goods at
same time, automatically delivering
on either up or down run



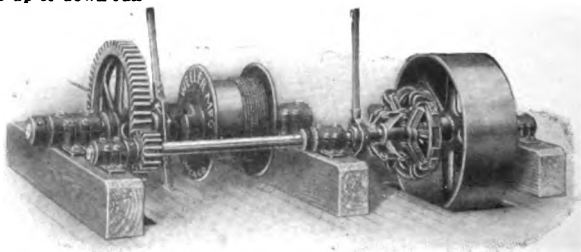
COLD-ROLLED SCREW CONVEYOR



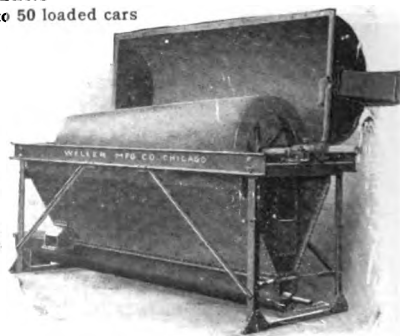
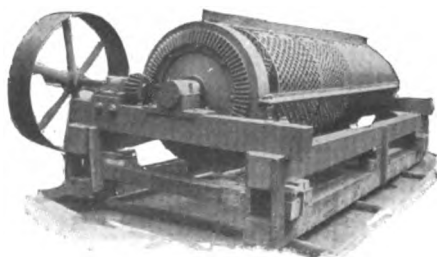
STEEL CONVEYOR BOXES



**ELEVATOR
CASINGS**
Of any design to
suit any require-
ments



CAR PULLERS
For handling from 1 to 50 loaded cars



REVOLVING SCREENS, OPEN OR ENCLOSED

STANDARD CONVEYOR COMPANY

(Formerly Minnesota Manufacturers' Association)

OFFICE AND FACTORY: NORTH ST. PAUL, MINN.

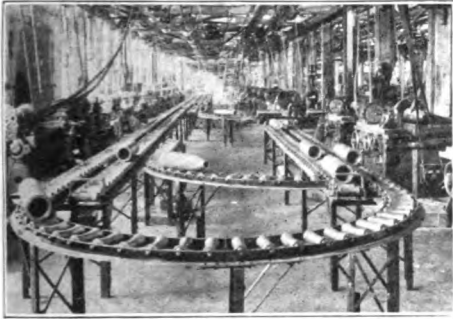
NEW YORK OFFICE: 39-41 Cortlandt St.

CHICAGO OFFICE: 549 W. Washington St.

WASHINGTON OFFICE: 711 A St., S. E.

Representatives in All Principal Cities

Manufacturers of Gravity Roller Conveyor, Automatic Straight Lift Elevator, Incline Elevator, Gravity Spiral Chutes, and Power Conveying Machinery for the Transporting and Elevating of Boxed, Cased and Packaged Merchandise

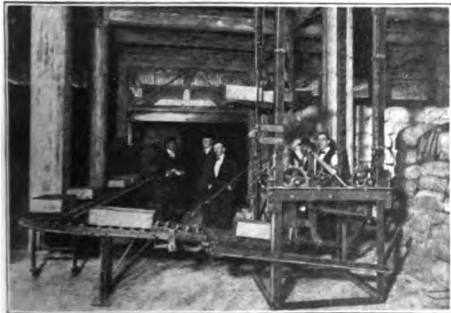


Reproduction of Standard conveying system installed in an ammunition manufacturing plant. The shells, in the course of being manufactured, are conveyed to and from various machines by means of Standard Gravity concave cast roller conveyor.

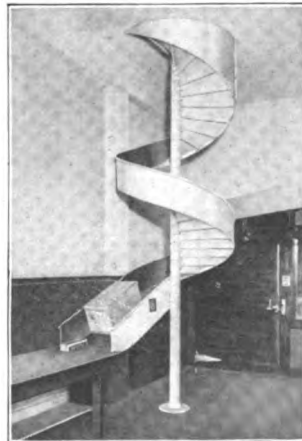
A cylindrical-shaped object varying from 2" diameter to 12" can be successfully conveyed on both straight and curved section of conveyor.

Experienced and practical engineering knowledge is back of every lay-out, drawing or design submitted by the Standard Conveyor Company. No matter how complicated your handling problems are, there is a COMBINATION SYSTEM that will fit your conditions and place your plant on a modern basis of handling and production.

Send for illustrated catalog and also bound volume of house organ "Gravity" showing what Standard Conveying Systems are doing in saving labor and doubling production in plants of all lines of industry.



Filled cases are loaded on Standard Gravity Roller Conveyor extending into car, conveyed to straight lift elevator, automatically received, elevated and discharged to line of gravity conveyor on upper floor.



Merchandise of almost every conceivable character, size, shape or weight can be lowered at a safe and uniform rate of speed on Standard Gravity Spiral Chute.

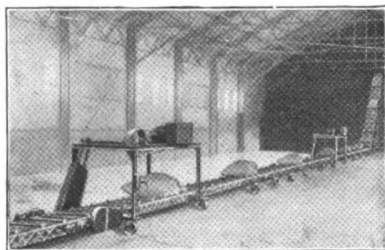
BROWN PORTABLE CONVEYING MACHINERY CO.

MAIN OFFICE AND PLANT: CHICAGO, ILL., U. S. A.

Sales Representatives in the Principal Cities and in all Important Foreign Countries

PORTABLE and SECTIONAL CONTINUOUS MOTION CONVEYORS—ELEVATORS (PILERS) LOADERS—UNLOADERS for the Low-Cost Handling of Packed Materials

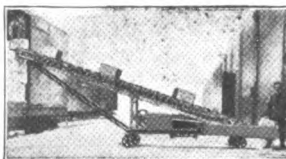
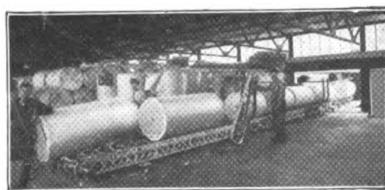
Brown Portable Continuous Motion Handling Machines handle any form of packed materials at a saving of from 50 to 75 percent over hand methods, and in from one-third to one-half the time. They handle such as barrels, bags, boxes, bales, rolls, drums, coils, etc.



Adjustable portable Elevators to elevate, or pile; load trucks; or carry to upper floor—all done by one machine: portable and sectional Conveyors; portable Loaders-Unloaders to unload boats, cars, etc. Either machine operates singly, or, connected, they can, say, unload and elevate; or unload, convey and elevate; or unload and convey in one continuous travel. Reversible in motion—convey in either direction.

"Brown-Portables" are used in industrial plants, warehouses, by governments, steamship companies, railroads—in 39 different countries—wherever labor and time are brought to their lowest cost and highest efficiency. Every possible handling condition is provided for as they are designed to fit the work.

Send details of conditions and ask for Bulletin 40-3.



PORTABLE MACHINERY CO., INC.

PASSAIC, N. J.

THE SCOOP CONVEYOR

The Scoop Conveyor is an exclusive type of light-weight portable belt conveyor designed to be handled by one man and to assist the hand shoveler in moving loose materials such as coal, coke, ashes, crushed stone, sand, gravel, etc. It will also handle sacks, packages, boxes and manufactured products.

We call it Scoop Conveyor because the carrying belt receives its load over a scoop which can be pushed or completely buried into the material to be conveyed. This exclusive feature can be found on no other belt conveyor. The *time, labor and money saving* features of the Scoop Conveyor are so apparent that a few figures will enable you to arrive at its saving over your present operating costs.

Specifications of Type "A" Scoop Conveyor

DIMENSIONS—(See diagram opposite).

WEIGHT—1050 Lbs., Standard Size; 1350 Lbs., Long Size.

HORSE POWER—2 H. P., Standard Size; 3 H. P., Long Size.

GUARANTEE—We guarantee the carrying belt to handle at least 5000 tons of coal or 4000 tons of ashes or sand, making cost of belt renewals less than one cent per ton on coal and slightly over one cent per ton on ashes or sand.

In asking for further information, give full operating conditions, kind of material to be handled, from where will machine receive material, to where will machine deliver material, kind of power available, etc.

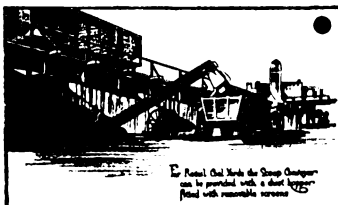
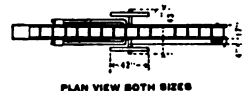
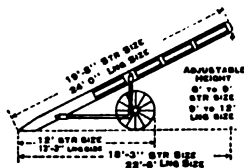
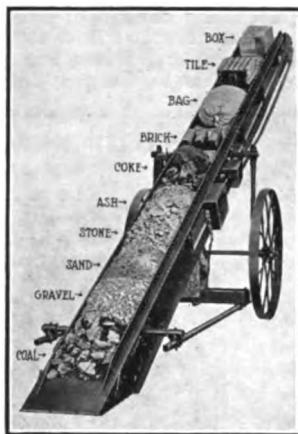
Machines can be furnished with either electric motor or gasoline engine. We furnish motor installation instructions and carry in stock drive reductions for any motor speed from 700 R. P. M. to 1800 R. P. M.

Capacity and Method of Feeding

The carrying capacity of the Scoop Conveyor based on handling coal is one ton in one minute, providing a sufficient amount of coal is maintained at the receiving end of the machine. If the storage pile is of considerable height, one man can readily feed one ton in one and one-half minutes. If the pile is low, he will require anywhere from two to four minutes to feed one ton. Where speed is required under unfavorable conditions two men may be provided for feeding.

In unloading hopper bottom cars the machine can be readily supplied to its full capacity of one ton per minute.

Large size coal, foundry coke and crushed stone fed from storage pile by one man requires anywhere from three to six minutes to feed one ton, or half that time if fed by two men.



THE ALLIANCE MACHINE COMPANY

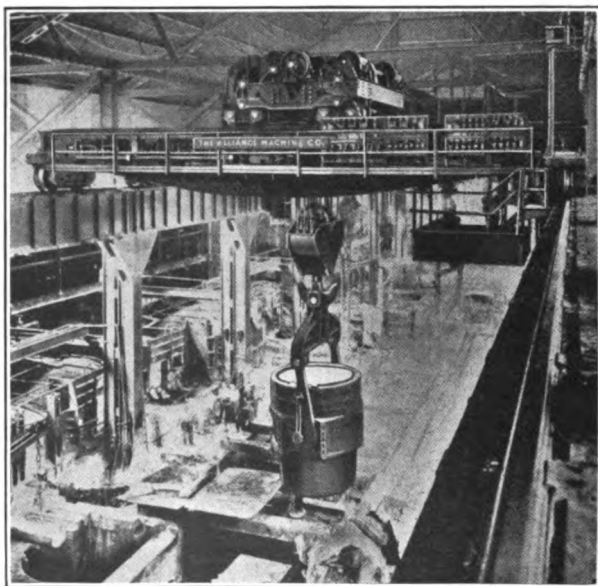
ALLIANCE, OHIO

PITTSBURGH

BIRMINGHAM

Engineers and Builders of Electric Traveling Cranes and Machines of All Types for All Purposes; Ore Bridges; Rolling Mill and Hydraulic Machinery; Riveters, Steam Hammers, Heavy Punches and Shears; Coke Plant Machinery, Scale Cars and Charging Larries; Copper Converting Machinery

"ALLIANCE" ELECTRIC TRAVELING CRANES



The above illustration shows a 200-ton Single Trolley Crane Ladle design and furnished by us for the Carnegie Steel Company. They have recently placed an order with us for an exact duplicate of this crane, after three years of service, without requiring a single change to be made.

We have built for the Bethlehem Steel Company two similar type cranes, one of 225-ton and one of 250-ton capacity.

We are not only the largest builders of Electric Traveling Cranes in the world, but also the builders of the largest Electric Overhead Traveling Cranes that have been built.

We Have Built:

The largest single trolley crane, 336 tons capacity.

The largest ladle crane, 200 tons capacity.

The largest stripper crane, 320 tons capacity.

The largest high type soaking pit crane, 25 tons capacity.

The largest slab charging machine.



THE BROWN HOISTING MACHINERY COMPANY

CLEVELAND, OHIO

NEW YORK: 50 Church St.
CHICAGO: 208 S. LaSalle St.

PITTSBURGH: Oliver Bldg.
SAN FRANCISCO: Monadnock Bldg.

Engineers and Manufacturers of Locomotive Cranes, Heavy Dock Machinery, Bridge Cranes, Etc., as well as smaller Cranes and Hoists

BROWNHIST

COAL AND ORE HANDLING MACHINERY—Bridge tramways, fast plants, cantilever cranes, gantry cranes, furnace hoists, larries, transfer cars, bins, car tipples, and pig iron breakers. These machines are designed for the rapid handling of material and a long service. They are installed in many parts of the world.

LOCOMOTIVE CRANES—Eight- and four-wheel and for any gauge track; speediest locomotive crane built; equipped with M. C. B. couplers, standard trucks and fittings, steam brake, all steel gears; can be fitted with either a bottom-block, any kind of bucket, shovel attachment, magnet or piledriver, all interchangeable in a short time; easily operated; fitted with steam or electric power or with an internal combustion engine.

BUCKETS—Grab buckets, two and single rope; drag line buckets; contractors' clam shell buckets; slag buckets; and tubs. The designs of these buckets are such that they get a full load each time and are under the control of the operator at all times. The best of material is used throughout, giving strength and durability to the spades, bearings, and digging edges.

TRAMRAIL SYSTEMS—These systems handle all the material overhead, reaching every floor in each building and as much yard space as desired. We install the systems complete, using the well-known Brownhoist trolleys, which are recognized as the standard trolleys. Operated by electric or hand power.

OVERHEAD HAND TRAVELLING CRANES—Furnished in various capacities and spans. Built for easy operation, safety and low headroom. They are easily and quickly erected. Prompt shipment can be made. Operated with hand hoist, air hoist, or electric hoist.

FREIGHT HANDLING EQUIPMENT—This includes several different machines designed for handling the freight at a much reduced cost over the present methods. The freight is handled overhead from car to sorting platform, warehouse, wagon or other cars. It requires just a few men, eliminates confusion and costly mistakes, and increases the terminal capacity.

CONCRETE REINFORCEMENT—Ferroinclave is a patented corrugated sheet steel used as a reinforcement for concrete. It requires no forms during erection, and is easily laid by the workmen. It is used for concrete roofs, floors, bins, walls, partitions, silos, bridges, stairs, etc.

We also make power scraper shovels, work-car cranes, jib cranes, pillar cranes, bridge cranes, crabs, winches, transfer tables and water-closet shields.

Catalogs and prices furnished on request.



INDUSTRIAL WORKS

BAY CITY, MICH.

BRANCH OFFICES: 50 Church St., New York, and Widener Bldg., Philadelphia

Builders of Locomotive, Erection and Wrecking Cranes; Gasoline Coaling Cranes; Pillar Cranes; Transfer Cranes; Pile Drivers; Transfer Tables; Portable Rail Saws; Grab Buckets; Lifting Magnets; and Pile Driver Steam Hammers

AGENTS: C. B. Davis Engineering Co., Birmingham, Ala.; J. C. Miller, St. Louis, Mo.; F. H. Hopkins & Co., Montreal, Que., and Toronto, Ont.; Northwestern Equipment Co., Portland, Ore., and Seattle, Wash.; N. B. Livermore & Co., San Francisco, Cal.

INDUSTRIAL WORKS was founded in 1873 and Industrial Works Cranes of to-day are the development of over forty-five years' experience. Satisfactory service under widely varied conditions of service has proved that they are fundamentally correct in design, sturdy in construction and efficient in operation. In size they range from 2-ton hand operated cranes to wrecking cranes of 160 tons capacity.

LOCOMOTIVE CRANES.—Industrial Works Cranes, steam, gasoline or electrically operated, are made in capacities of from 5 to 60 tons, and with booms from 20 to 125 ft. long. They are mounted on four- or eight-wheel cars for standard or special gauge track, or on boats and gantries. Being self-propelling, they can switch several loaded cars. These cranes may be used with grab buckets, hook and block, lifting magnets, or arranged for operating with a drag-line bucket, pile-driver leads or a steam-shovel dipper arm.

Mechanically, Industrial Works Cranes are not excelled. Every essential part of the entire crane is made, assembled and tested in our own extensive shops. All parts of the crane are accessible for easy examination, a large man being able to pass through the machinery part and car to the ground. Absolute interchangeability of parts is assured by the use of jigs and templates at every possible point in the construction. Inconvenient bearings are lubricated through oil pipes. The propelling gears on 8-wheel cars are placed in or out of mesh from the outside of the car body. For clam-shell bucket work, both drums are independent and the auxiliary take-up drum for the holding line is automatic in its action, requiring no attention from the operator.

Data.—In general all sizes of locomotive cranes do the same kind of work, the amounts being limited, of course, by their capacities. The 60-ton capacity cranes are used chiefly for erection purposes; those from 20 to 40 tons for erection work or for handling large quantities of material with a bucket or magnet; cranes from 5 to 20 tons are general purpose machines, and are in general use for all kinds of loading and placing of material.

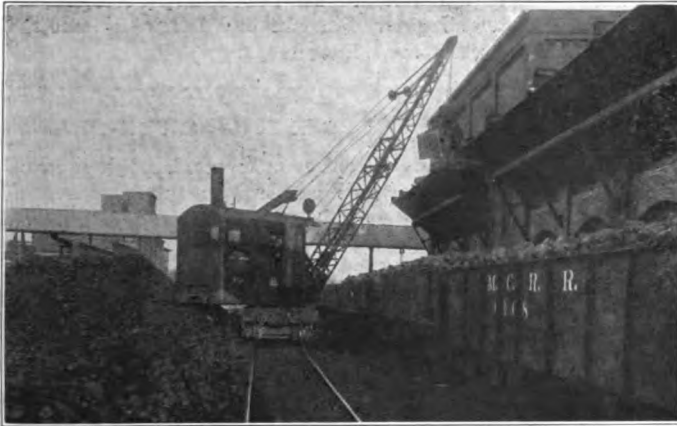
Locomotive cranes are usually rated according to their maximum free capacity at the minimum radius (about 12 ft.). The table gives the approximate radius in feet at which various size cranes will handle clam-shell buckets full of coal and sand. (A 1½-cu. yd. bucket holds approximately one ton of coal.)

		1½-Yd. Bucket			2-Yd. Bucket		
	5-ton	12-ton	15-ton	20-ton	25-ton	30-ton	40-ton
Coal	20	25-37	41-46	48-52	49-52	52-54	58-61
Sand	18	25-33	36-41	44-48	37-41	42-46	47-51

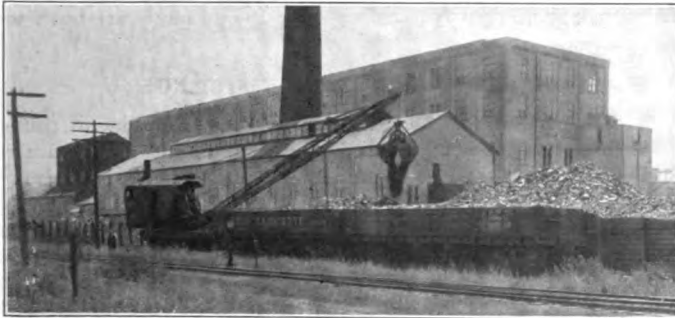
To unload material with a grab bucket from the far end of a modern gondola car standing on the same track as the crane requires a 50-ft. boom. In general, the shorter the boom, the easier and faster will be the operation of the crane.

WRECKING CRANES.—The standard wrecking cranes since 1883. Built in capacities of 75, 100, 120, 150, and 160 tons.

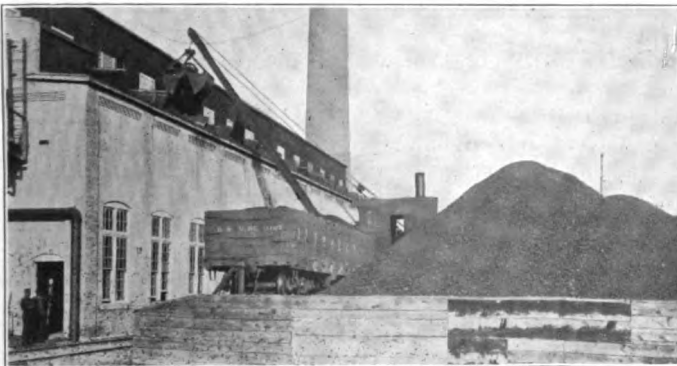
INDUSTRIAL WORKS



A Flexible System. Coal may be handled with the crane: 1, from cars to bunkers; 2, from cars to stock pile; 3, from stock pile to bunkers



Unloading Coal into Storage



Direct from Car to Overhead Bunkers

CLYDE IRON WORKS

29th AVENUE WEST, AND MICHIGAN ST., DULUTH, MINN.

Manufacturers of Hoisting Engines, Derricks and Derrick Fittings, Electric Hoists, Belt-Driven Hoists, Automatic Buckets

HOISTING ENGINES AND BOILERS OF CLYDE-GRADE

Our product is used for all kinds of Contractor's work, Dredging, Pile Driving, Railroad and Bridge Building, Quarries and general hoisting purposes. We also make a specialty of engines for skidding and loading logs, and for general logging operations.

All our engines are thoroughly tested under steam as well as by the usual hydrostatic test. All parts are made from standard jigs and templates and are absolutely interchangeable.

ONE, TWO, THREE, AND FOUR DRUM HOISTING ENGINES

In our 235-page catalog we illustrate the 2099 types and sizes of our standard engines with single or multiple drums, and single or double cylinders. These hoisting engines are regularly built with or without boiler, winch and sheave heads, and reversing gear. Clyde hoists of 7 x 10 and larger are built with all-steel gears.

DERRICKS AND DERRICK FITTINGS

In this large catalog we also illustrate and list a complete line of timber derricks and fittings. Bulletin "N" contains our new line of All-Steel Derricks. All usual conditions can be met with some one of our standard styles, but we are prepared to build derricks for any special conditions that may arise. For this purpose we maintain a force of draftsmen and engineers who are specialists in this line, and their experience of many years is at the disposal of our customers.

Clyde Derricks are designed with great care to withstand violent strains. Every possible point of weakness, both in the fittings and in their action on the timbers, has been guarded against and we claim our fittings to be the strongest on the market for the size of timbers for which they are intended.

Following is a partial list of our standard styles of derricks:

Standard Guy Derricks	Hand Power Stiff Leg Derricks
Half Hand Power Guy Derricks	Clam Shell Stiff Leg Derricks
Hand Power Guy Derricks	Full Circle Stiff Leg Derricks
Clam Shell Guy Derricks	Self-Propelling Derrick Cars
Standard Stiff Leg Derricks	Self-Contained Portable Derricks
Half Hand Power Stiff Leg Derricks	All-Steel Derricks

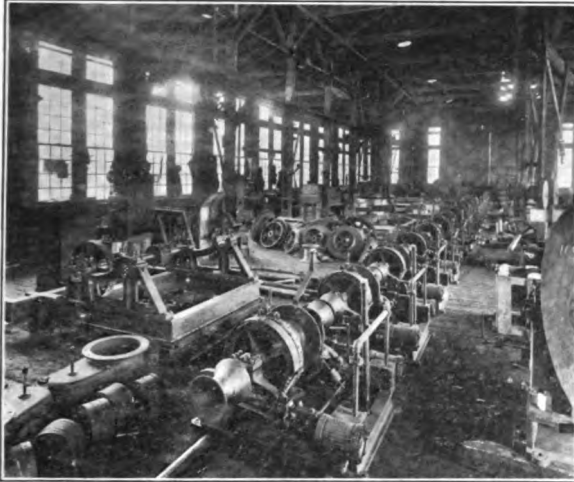
We also manufacture a complete line of logging machinery, of land-clearing machinery and of excavating machinery, including the CLYDE TOWER EXCAVATOR for levee building and drainage-canal digging.



S. FLORY MANUFACTURING CO.

MAIN OFFICE, BANGOR, PENNA.

NEW YORK OFFICE: 95 Liberty St.



A Small Portion of Our Main Assembling Floor
Winches for the Allies Completed and Ready for Shipment

ELECTRIC

SPECIALISTS IN

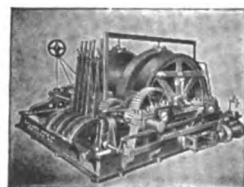
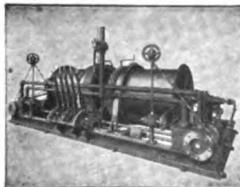
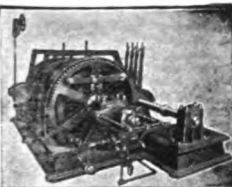
STEAM

Mining Hoists—Cone or Band Friction.

Marine Equipment—Winches—Capstans—Dock Hoists—Marine
Railway Engines—Dredging Engines—Spud Hoists—Etc.

Contractors' Equipment—Derrick Hoists and Fittings—Drag Line
Engines—Boom Swingers—Etc.

Cableways—For Bridge and Dam Building, Removing Top
Conveying Materials, Sewer Building, Etc.



ROBT. HOLMES & BROS.

(Incorporated)

Successors to Danville Foundry and Machine Co.

DANVILLE, ILLINOIS, U. S. A.

Engineers, Founders, Machinists and Boilermakers

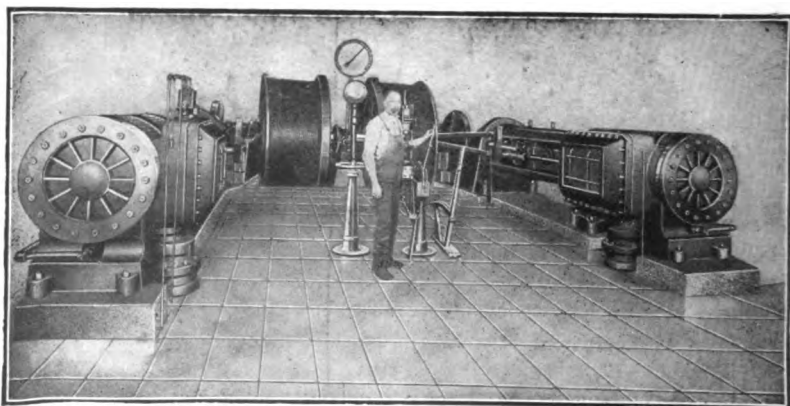
BUILDERS OF

HOISTING AND HAULAGE ENGINES

SHAKER SCREENS AND WEIGH HOPPERS

SELF-DUMPING CAGES AND EMPTY CAR LIFTS

MILL AND MINE SUPPLIES



Danville Hoisting and Haulage Engines, Both Light and Heavy Duty Type, First and Second Motion

Halbert's Patent Self Dumping Cages

Ray's Patent Self Dumping Cage

Plain Cages

Holmes' Shaker Screen

Holmes' Telescoping End Loader

Holmes' Patent Weigh Hopper

Holmes' Automatic Car Lifts for Mine Bottoms

Iron, Bronze and Brass Castings of All Description

Heavy Iron and Steel Forgings

All Kinds of Plate Metal Work, Particularly for Coal Mines

LIDGERWOOD MANUFACTURING CO.

MAIN OFFICES

96 LIBERTY ST., NEW YORK

BRANCH OFFICES:

CHICAGO, Fisher Building
SEATTLE, 65 Columbia Street

PITTSBURGH, Union Bank Building
PHILADELPHIA, Widener Building

LONDON, ENGLAND

LOS ANGELES, Central Bldg

Manufacturers of Steam Hoisting Engines, Electric Hoists, Gasoline Hoists, Cableways, Dredging and Excavating Machinery, Logging Machinery, Ship and Dock Winches, and Steering Engines

FOREWORD: The Lidgerwood hoisting machinery of today embodies every improvement in design and construction developed by our 45 years' experience. We have devoted ourselves exclusively to the manufacture of hoisting and hauling machinery.

It is our practice to design the complete machine to operate under the maximum service it is to perform, and to build every part to meet the full working capacity of the machine.

Every part is accurately constructed upon the duplicate part system, insuring the absolute fitting of repair parts.

We have kept pace with the development of electrical engineering, and can supply our electric hoists equipped with the latest automatic control and safety devices, and type of motor best adapted for the work to be done by the hoist.

Our friction drum hoists have cork inserted friction woods. This increases the holding power of the friction and greatly reduces the power required to apply the friction. The entire friction mechanism is extremely simple.

STEAM, ELECTRIC AND GASOLINE HOISTS for all kinds of derrick service, including grab bucket work.

STEEL DERRICKS of all types; derrick fittings for wooden derricks.

PILE DRIVING HOISTS, pile driving frames and hammers.

HIGH SPEED BUILDERS' HOISTS for operating material and hod elevators.

STEAM AND ELECTRIC HOISTS designed for shaft and tunnel work, bridge erection and to meet every requirement of contracting work.

DREDGING AND EXCAVATING MACHINERY. Steam and electric bucket and swinging engines for operating both grab and scraper buckets on land and water outfits, both for dredging, and for loading and unloading sand, gravel and coal barges.

Spud engines and cutter engines for suction dredges.

Built with special regard to the severe duty such machines perform.

STRAIGHT LINE CABLEWAY EXCAVATORS, steam or electric driven, with traveling towers, built in spans to meet service required. Operate drag scraper, or grab buckets.

The high conveying speed enables them to excavate material rapidly and economically over wider areas than it is practicable to reach with the revolving type of excavator. Have handled 55 trips per hour, over a reach of 500 feet, using a three cubic yard scraper bucket.

CABLEWAYS: Lidgerwood cableways, steam or electrically driven to handle loads of from one to fifty tons, with spans up to 3,000 feet and with or traveling towers. A prominent feature is the high speed fall rope carrier.

MINE HOISTS for every character of incline haulage and mine shaft service. Steam hoists built up to 1000 H. P. and electric in any size, and fitted with complete control and safety appliances.

LOG HANDLING SYSTEMS: High speed ground and overhead log skidding systems.

RAPID UNLOADERS for unloading ballast cars.

CAR HAUL HOISTS.

INCLINE COAL HOISTS.

COAL TOWER BUCKET AND TROLLEY HOISTS.

SHIPS CARGO AND DOCK WINCHES. Steam and electric; a type designed for each method of cargo handling.

STEERING ENGINES, of all types.

We will gladly send catalogues covering above products.



THE WELLMAN-SEEVER-MORGAN CO.

CLEVELAND, OHIO, U. S. A.

Engineers and Manufacturers

WORKS: CLEVELAND AND AKRON, OHIO BRANCH OFFICES: NEW YORK, DENVER, SEATTLE



Twelve Foot Double Drum Direct Action Mine Hoist

WATER POWER EQUIPMENT

Hydraulic Turbines, Vertical and Horizontal Settings for all heads up to 800 feet. Especially designed for High Efficiency.

MINING MACHINERY

Hoists, Haulages and Gravity Incline Machines, Steam and Electric Driven, from 3 H. P. to 2000 H. P. in any combination of equipment for any service.

Cages, Skips, Safety Detaching Hooks and Sheaves.

Chilian Mills, Car Tipples, Dumping Cradles and Head Frames.



15000 Horse Power Turbine

IRON AND STEEL WORKS EQUIPMENT

Open Hearth, Heating and Annealing Furnaces and Metal Mixers.

"Wellman" Charging Machines and Manipulators. High and low floor and crane types. Open Hearth Charging Cars and Boxes.

"Hughes" Continuous Mechanically Poked Gas Producers and W-S-M Gas Shut-off Valves.

"Forster" Water-Sealed Reversing Gas Valves. Blooming Mills and Engines.



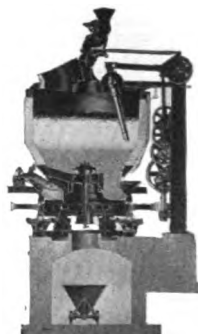
Wellman Open Hearth Charging Machine

COKE OVEN MACHINERY



Combined Coke Pusher and Coal Leveler

Coal Levelers, Coke Pushers and Door Extractors, in separate or combined machines, Charging Cars, Quenchers and Loaders.



Hughes Gas Producer

ORE AND COAL HANDLING MACHINERY



Boat Loading Coal Car Dumper

W-S-M Automatic Vessel Unloaders, Steam, Electric and Hydraulic driven. Bridges for unloading and Stocking Ore, Coal and Limestone.

Buckets: two part Clam-Shell.

Car Dumpers: steam and electric driven. Revolving Derricks and Bucket Handling Cranes.

Catalogues or Bulletins, and prices furnished on request.

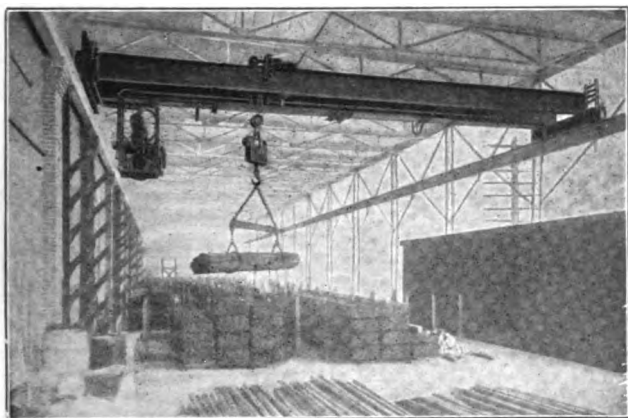


NEW JERSEY FOUNDRY & MACH. CO.

88 WEST ST., NEW YORK

Manufacturers of Overhead Carrying Devices

**HAND AND ELECTRIC TRAVELING CRANES
TROLLEYS, HOISTS AND MONORAIL EQUIPMENT**



273



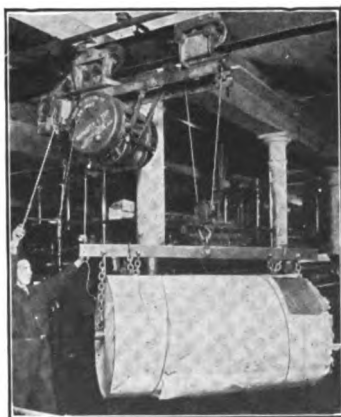
"Changeezy" I-Beam Trolley (Patented)

Can be used both plain and geared. Made with steel side plates and adjustable to three sizes of beam standard.



"Delta" I-Beam Trolley (Patented)

The wheels of both Changeezy and Delta trolleys are inclined to run true on lower flanges of the beam, the axle connection swivels, equalizing the load on all wheels, and the load force lines radiate from the inside of the hoist link.



Our Catalog 88 contains detailed information on our line of Overhead Carrying Devices, Tracking, Trolleys, Hoists, Cranes, Buckets, Cars, etc. Two representative installations are shown above. Many others illustrated in catalog. A copy will be promptly sent on request.

SHEPARD ELECTRIC CRANE & HOIST COMPANY

NEW YORK
PHILADELPHIA
PITTSBURGH
CHICAGO
BOSTON

MAIN OFFICE & WORKS

MONTOUR FALLS, N. Y.

BALTIMORE
SAN FRANCISCO
BIRMINGHAM
MONTREAL
LONDON, ENGLAND
MELBOURNE, AUSTRAL.

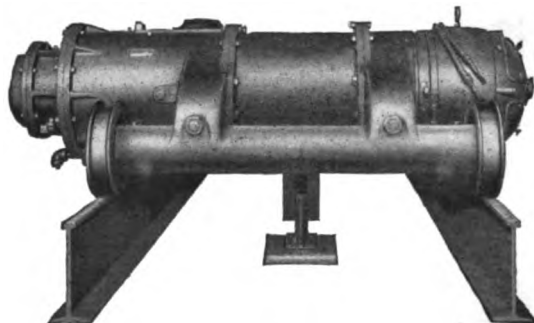
Direct and Alternating Cranes and Hoists for Every Service

THE SHEPARD LINE IS COMPLETE

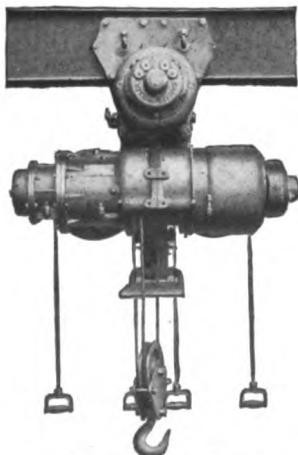
SHEPARD Cranes and Hoists are handling materials in ninety varied industries. The selection and extension of this equipment has been largely governed by the evident superiority of the design and the new standard of reliability in service which it has established.



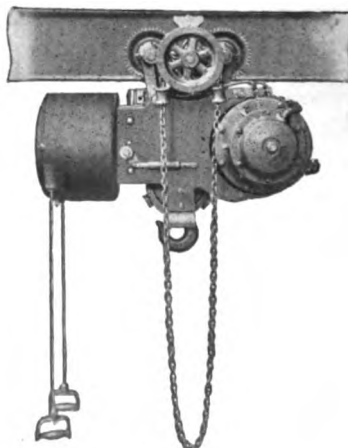
Our Handbook—describing the complete line—will be sent on request. Write for it Now.



The sterling qualities of the Shepard Crane Trolley are secured by locating steel gearing and multiple discs within rigid cylindrical frames, completely protected and completely protecting workmen.



Foundry Control, D. C. Hoist with Motor Driven Trolley. Especially useful where loads must be carried distances too long for the workmen to push them on the runway efficiently.



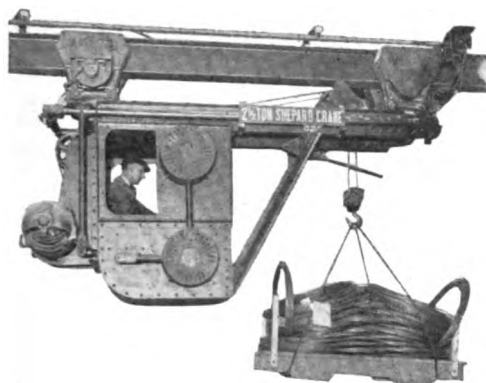
The use of this type of hoist permits hoist service in low headroom where sufficient lift could not be otherwise obtained.



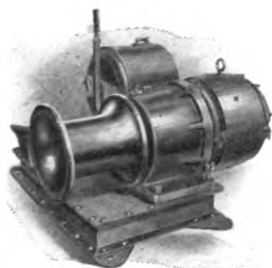
SHEPARD ELECTRIC CRANE & HOIST COMPANY



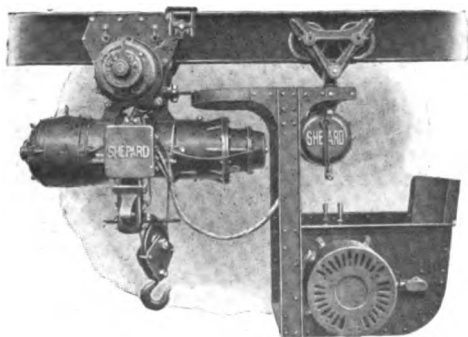
Our New Light Capacity Hoist, for handling of loads just too heavy for one man.



Where groups of small units in trays are to be handled, this type of hoist has decided advantages, particularly where there are curves in the I-beam runway. It can be supplied with two load hooks where long flexible loads are to be handled.



A compact, weather-proof winch with running parts completely enclosed and protected from all atmospheric conditions. Its uses are manifold in and about industrial plants.



The use of heavy duty Monorail Hoists with the flexibility of handling arrangements which transfer switches permit, revolutionizes handling methods in many industries. Can be enclosed for outdoor service.

275

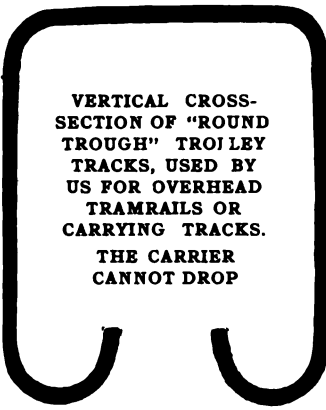


"HOIST? BUY A SHEPARD"

THE COBURN TROLLEY TRACK MANUFACTURING CO.

HOLYOKE, MASS.

Manufacturers of Overhead Tramrails, Traveling Cranes, Electric and Pneumatic Hoists, Door Hangers, Fire Shutters, Fire Escapes, Etc.



VERTICAL CROSS-SECTION OF "ROUND TROUGH" TROLLEY TRACKS, USED BY US FOR OVERHEAD TRAMRAILS OR CARRYING TRACKS. THE CARRIER CANNOT DROP

COBURN OVERHEAD CONVEYING SYSTEM

The users of Coburn Overhead Conveying systems are so various that it is quite impossible to enumerate them all—They can be used anywhere that heavy material has to be handled—Coal to the boiler room—Ashes and cinders to the dump head—Iron in foundry and machine shops—etc.,—etc.

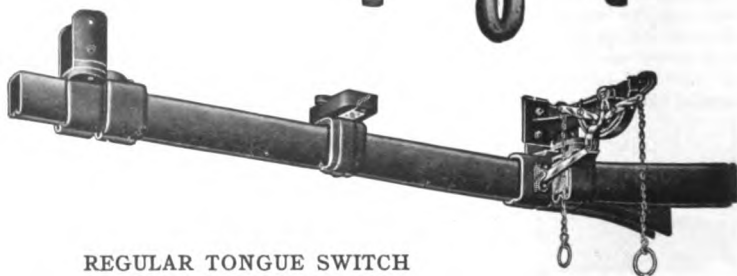
Besides the enclosed type of track, we manufacture a complete line of Overhead I-Beam track, carriers, switches, etc.

We furnish free of cost estimates on all this class of work on receipt of detailed information as to requirements.

Our No. 50 catalogue is free for the asking.

SWINGING PENDANT DOUBLE CARRIERS

A typical Coburn Carrier which can be equipped with either roller or ball bearings, and so constructed as to move around the smallest curves with the greatest ease.



REGULAR TONGUE SWITCH

No matter how complicated your system may be, we can make satisfactory arrangements for the switches—Our switches are absolutely safe—They cannot under any conditions drop the load.

FARNHAM MANUFACTURING CO.

31-39 INDIANA ST., BUFFALO, NEW YORK

Manufacturers of Elevating, Conveying Machinery; Brass and Copper Mill Machinery; Trolleys, Switches, Turntables, Etc.; Paper Mill Specialties



PLAIN AND GEARED TROLLEYS

Our trolleys are constructed of steel and are very strong and durable. Wheels are large in diameter and can be ordered to fit any size I Beam.



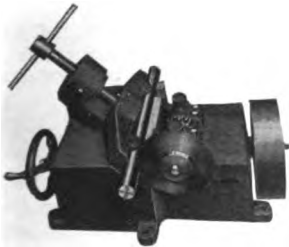
SWITCHES, TURNTABLES AND TROLLEY SYSTEMS



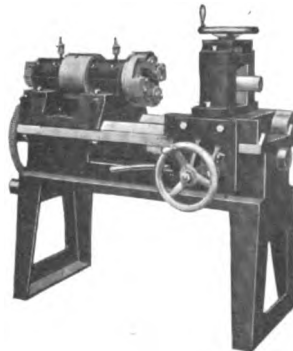
FOUR ROLL CRUSHERS FOR COAL, COKE, ETC.



TWO ROLL CRUSHERS FOR COAL, COKE, ETC.



TESTING SAWS for testing Brass and Copper Rods.

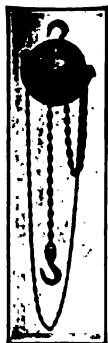


ROD POINTING MACHINES for pointing Brass and Copper Rods.

FORD CHAIN BLOCK & MFG. CO.

SECOND AND DIAMOND STS., PHILADELPHIA, PA.

Manufacturers of the Ford Tribloc Chain Hoist, Screw Gear Hoists, Differential Hoists and Plain and Geared Trolleys



THE FORD TRIBLOC CHAIN HOIST

The Ford Tribloc Chain Hoist is built in sizes from one-half to forty tons capacity. It is equipped with the patented Loop Hand-Chain Guide which protects the working parts, keeps the chain from gagging, and enables you to operate at any angle and at any speed you may wish to. It has steel working parts, planetary gearing (which is enclosed in a dust-proof steel case), and a $3\frac{1}{2}$ -to-1 factor of safety in its weakest part. Eighty per cent. of the power applied to the hand-chain of the Tribloc is converted into lifting energy.

PRICE LIST—TRIBLOC CHAIN HOISTS

Capacity in Tons	Price Complete	Regular Hoist in Feet	Extra Hoist Price per Foot	Net Weight in Pounds	Feet of Chain Handled to Lift Load One Foot
$\frac{1}{2}$	\$35.00	8	\$0.90	54	21
1	45.00	8	.95	80	31
$1\frac{1}{2}$	60.00	8	1.00	124	35
2	70.00	9	1.05	188	42
3	90.00	10	1.50	200	69
4	110.00	10	1.60	290	84
5	140.00	12	2.15	380	126
6	165.00	12	2.15	390	126
8	200.00	12	2.70	470	168
10	240.00	12	3.25	570	210
12	300.00	12	4.30	800	126
16	360.00	12	5.40	1000	168
20	425.00	12	6.50	1375	210
32 } 40 }					

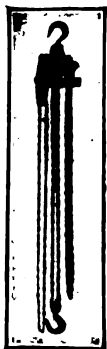
Prices and full particulars upon request.

278

SCREW HOISTS

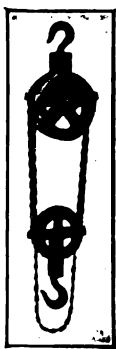
(Duplex Type)

For work where the highest speed and efficiency are not required, we can furnish the Ford Duplex Type Worm Gear Hoist. This type of hoist is frequently preferred for portable use, as it is lighter in weight and at the same time powerful and durable.



DIFFERENTIAL HOISTS

This is the simplest of all chain hoists, and where a hoist is required but occasionally and high efficiency and speed are not essential, it serves the purpose admirably. The Ford Differential Hoist is made with exceeding care and of the best material obtainable.



ROLLER BEARING STEEL PLATE TROLLEYS

We carry in stock ready for immediate shipment, a line of Roller Bearing Steel Plate I-Beam Trolleys in a wide range of sizes, and in both the plain and geared types. Trolleys can be widened to suit larger than standard beams.

Send for a copy of our catalogue.
It gives prices and goes into details.



NEWHALL CHAIN FORGE & IRON CO.

90 WEST ST., NEW YORK

156 SECOND ST., SAN FRANCISCO

Manufacturers of Welded Chains of Every Description

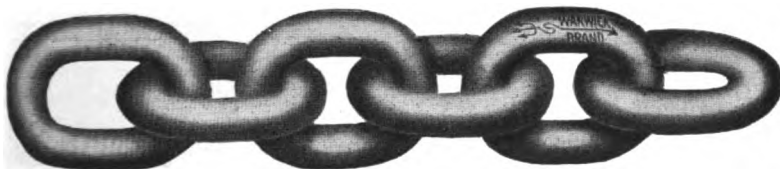
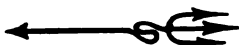


Fig. 320

STEAM SHOVEL AND DREDGE CHAINS, ALL SIZES

"TRIDENT"
LOADING CHAIN

TRADE MARK



Reg. U. S. Pat. Off.

"WARWICK"
DREDGE CHAIN

CHAINS FOR:

CARS
CRANES
CONVEYORS
DREDGES
ELEVATORS
HOISTS
LOGGING
MARINE
RAILWAYS
MILL TRUCKS
POCKET
WHEELS
QUARRIES
RAFTING
SPROCKETS
STEAM
SHOVELS
ETC.

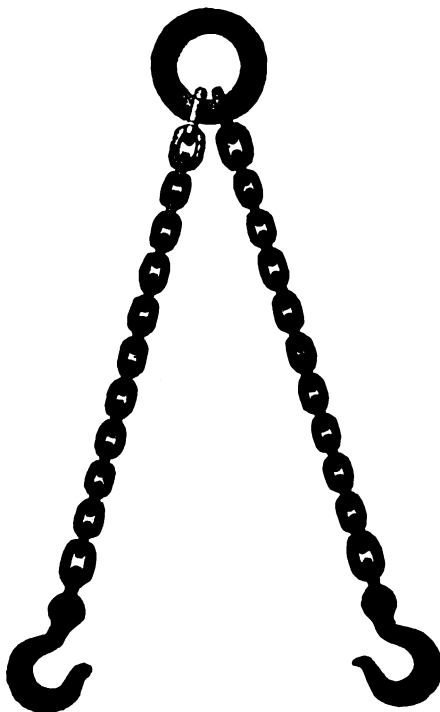


Fig. 355

SLING CHAINS, ALL STYLES

Write for Catalogue.

DROP
FORGINGS
HAND
FORGINGS
CHAIN HOISTS
CHOCKS
CLEATS
CLEVICES
COLD SHUTS
COMBINATION
DRILL PRESS
GUY CLAMPS
HOOKS
REPAIR LINKS
SHACKLES
SWIVELS
WIRE ROPE
CLIPS

MACOMBER & WHYTE ROPE CO.

HOME OFFICE AND WORKS

KENOSHA, WISCONSIN

BRANCHES AT

CHICAGO

PORTLAND

PITTSBURGH

Makers of Wire Rope of Every Description

WIRE ROPE

"Monarch Whyte Strand" is made from wire having a tensile strength of from 220,000 to 280,000 pounds per square inch—it is superior to any other wire rope made—it is uniform and dependable—the strongest, toughest and most durable rope obtainable—this is the best—but we make all grades—and all constructions—some are listed below.



STANDARD HOISTING ROPE

6 Strands of 19 Wires Each—1 Hemp Center

LIST PRICE PER FOOT IN CENTS

Dia. of Rope.....	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2
Monarch Whyte Strand.....	13	14 1/2	17	22 1/2	31	39	50	62	75	90	1.10	1.30	1.60
Plough Steel.....	12	12 1/2	14	19	26	34	43	54	65	79	93	1.08	1.30
Crucible Steel.....	9	9 1/2	11	14	19	24	31	38	46	56	66	77	90

BREAKING STRENGTH IN TONS OF 2000 LBS.

Monarch Whyte Strand.....	3.5	6.7	12	19	26	35	45	56	69	84	98	110	133	150	166
Plough Steel.....	3	6	10	16	23	29	38	47	58	72	82	94	112	127	140
Crucible Steel.....	2	5	8	12	17	23	30	38	47	56	64	72	85	96	106
Weight Per Foot—Lbs.....	.10	.22	.39	.62	.89	1.20	1.58	2.0	2.5	3.3	4.1	4.5	5.5	6.3	7.3

HAULAGE ROPE

6 Strands of 7 Wires Each—1 Hemp Center

LIST PRICE PER FOOT IN CENTS

Dia. of Rope.....	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2
Monarch Whyte Strand.....	8 1/2	11 1/2	13 1/2	17	20 1/2	28 1/2	37	48	58	72	82	94	1.05
Plough Steel.....	6	6 1/2	9	11 1/2	14 1/2	17 1/2	24 1/2	32	41	51	62	76	90
Crucible Steel.....	4 1/2	5 1/2	6 1/2	8	10	12	17	22 1/2	29	36	43	51	60

BREAKING STRENGTH IN TONS OF 2000 LBS.

Monarch Whyte Strand.....	4 1/2	6 1/2	7 1/2	11	13	17 1/2	25	33	42	52	67	79	90
Plough Steel.....	4 1/2	6	7	10	12	16	23	31	38	47	60	72	82
Crucible Steel.....	3 1/2	4 1/2	5 1/2	7 1/2	10	13	18 1/2	24	31	37	46	53	63
Weight Per Foot—Lbs.....	.15	.22	.30	.39	.50	.62	.89	1.20	1.58	2.0	2.5	3.3	4.1

KILINDO-PATENT NON-ROTATING ROPE

We are the patent owners and makers of this non-spinning non-twisting wire rope—particularly adaptable in all cases where the load hangs on the free end of a hoisting line—is more flexible than ordinary rope—has 200% greater wearing surface.



LIST PRICE PER FOOT IN CENTS

Dia. of Rope.....	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4
Monarch Whyte Strand.....	8 1/2	10	12	14	16	21	25	34	39	49	62	75	92	1.12
Plough Steel.....	7 1/2	9	11	13	15	19	23	30	36	43	55	64	82	1.07
Crucible Steel.....	6	7 1/2	8	9	12	16	20	25	30	37	43	53	63	73

BREAKING STRAIN IN TONS OF 2000 LBS.

Monarch Whyte Strand.....	6 1/2	12	14 1/2	19	26	35	45	56	69	84	98	133	166	210	263
Plough Steel.....	5 1/2	10	12	15 1/2	23	29	38	47	58	72	82	112	140	186	229
Crucible Steel.....	4 1/2	8 1/2	10	12 1/2	17 1/2	23	30	38	47	56	64	85	106	133	170
Weight Per Foot—Lbs.....	.25	.43	.55	.67	.95	1.31	1.72	2.2	2.7	3.3	3.9	5.5	7	8.8	11

Catalogue "M"—strictly up to date—sent upon request.

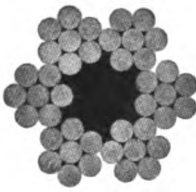
JOHN A. ROEBLING'S SONS COMPANY

TRENTON, N. J.

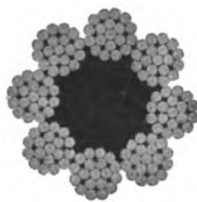
Manufacturers of Wire Rope of All Kinds



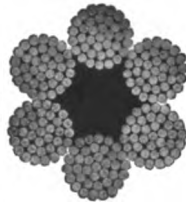
6 x 19



6 x 7



8 x 19



6 x 37

We manufacture and keep in stock at our works at Trenton and at warehouses at agencies and branches in large cities wire rope, made from Iron, Cast Steel, Extra Strong Cast Steel, Plough Steel and Blue Center Steel.

We give below tables of strengths, etc., for the standard constructions of BLUE CENTER STEEL ROPE. The rope is also furnished with 6 strands of 37 wires each and with 8 strands of 19 wires each.

This rope is recommended as the best to use where extreme conditions tend to bring extraordinarily severe stresses, and is particularly well adapted to resist abrasion.

The hemp center of this rope, where a hemp center is used, is colored blue to distinguish it from other grades.



BLUE CENTER STEEL HOISTING ROPE

Composed of 6 Strands and a Hemp Center, 19 Wires to the Strand

Trade Number	Diameter in inches	Approx. circumf. in inches	Approx. weight per foot	Approx. strength in tons of 2000 lbs.	Proper working load in tons of 2000 lbs.	Diam. of drum or sheave in feet advised
00	2 3/4	8 5/8	11.95	315	63	11
0	2 1/2	7 7/8	9.85	263	53	10
1	2 1/4	7 1/8	8	210	42	9
2	2	6 3/4	6.30	166	33	8
2 1/2	1 7/8	5 3/4	5.55	150	30	8
3	1 3/4	5 1/2	4.85	133	27	7
4	1 1/2	5	4.15	110	22	6 1/2
5	1 1/4	4 3/4	3.55	98	20	6
5 1/2	1 3/8	4 1/4	3	84	17	5 1/2
6	1 1/4	4	2.45	69	14	5
7	1 1/8	3 1/2	2	56	11	4 1/2
8	1	3	1.58	45	9	4
9	7/8	2 3/4	1.20	35	7	3 1/2
10	3/4	2 1/4	.89	26.3	5.3	3
10 1/4	5/8	2	.62	19	3.8	2 1/2
10 1/2	7/8	1 3/4	.50	14.5	2.9	2 1/4
10 3/4	1	1 1/2	.39	12.1	2.4	2
10a	1 1/8	1 1/4	.30	9.4	1.9	1 3/4
10b	1 1/4	1 1/8	.22	6.75	1.35	1 1/2
10c	1 1/2	1	.15	4.50	.9	1 1/4
10d	1 3/4	3/4	.10	3.15	.63	1

BLUE CENTER STEEL ROPE

For Hoistages and Transmissions. 6 Strands and a Hemp Center, 7 Wires to the Strand

11	1 1/2	4 3/4	3.55	90	18	11
12	1 1/4	4 1/4	3	79	16	10
13	1 1/4	4	2.45	67	13	9
14	1 1/8	3 1/2	2	52	10	8
15	1	3	1.58	42	8.4	7
16	7/8	2 3/4	1.20	33	6.6	6
17	3/4	2 1/4	.89	25	5	5
18	1 1/4	2 1/8	.75	20	4	4 3/4
19	1 1/8	2	.62	17 1/2	3.5	4 1/2
20	1 1/4	1 3/4	.50	13	2.6	4
21	1 1/2	1 1/2	.39	11	2.2	3 1/2
22	1 1/4	1 1/4	.30	7 1/2	1.5	3
23	1 1/8	1 1/8	.22	6 1/2	1.3	2 1/2

A copy of our catalogue, giving information about other wire ropes and wire rope fastenings, will be mailed on application.

WRIGHT WIRE COMPANY

WORCESTER, MASS.

BRANCH OFFICES: BOSTON, NEW YORK, PHILADELPHIA, CHICAGO, TULSA, OKLA.,
SAN FRANCISCO

Manufacturers of Wire, Wire Rope and Wire Products



WIRE ROPE

For All Purposes

We combine the highest quality of material with the greatest degree of skill in the manufacture of all our Wire Rope products.

Iron Ropes

Crucible Cast Steel Ropes

Plow Steel Ropes

Galvanized Ropes

Towing or Mooring Hawsers

Hoisting Ropes, Regular

Flexible, and Extra Flexible

Suspension Bridge Cables

**Ropes for Tramways, and Cable for
Transporting Coal, Ore, etc.**

**Ropes for Elevators, Power Trans-
mission, Mining and Logging**

Standing and Running Rigging

Derricks and Dredges

Tiller Ropes

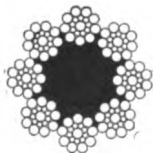
Copper Lightning Rod Cables

**All Kinds of Wire Rope, Fittings and
Appliances**

Ordinary forms and sizes always in stock. Special forms made to order promptly.

We furnish ropes of Swedish Iron, Crucible Cast Steel, Extra Strong Crucible Cast Steel, Plow Steel, Excelsior Plow Steel, Bronze or other material.

EXTRA FLEXIBLE ROPES, IRON, CRUCIBLE AND PLOW STEEL



8 Strands, 19 Wires
to the Strand—
1 Hemp Core



We desire to call special attention to our **Extra Flexible Ropes**, of which we manufacture large quantities, and which have become very popular with users of wire ropes in various industries.

Our **Extra Flexible Ropes** are made of eight strands around a hemp core, instead of the standard form of six strands. They are thoroughly efficient and very strong, and because of their much greater flexibility can be used under many conditions in which the use of six-strand ropes would not be feasible. They are designed for running over comparatively small sheaves.

Recommended for derricks, steam dredges, electric cranes, coal-hoists, for logging purposes, and for elevator cables.

In many cases where regular six-strand hoisting ropes have failed to work economically, our **Extra Flexible Ropes** have given perfect satisfaction in points of strength, length of service and economy.

Special flexible ropes are also made with 37 wires to the strand.

Wherever more than ordinary flexibility in wire ropes is desired, or the use of small sheaves and pulleys is necessary, we heartily recommend our **Extra Flexible Ropes**, made of our special high-grade quality of crucible cast steel and plow steel, which are the very best materials possible to use in wire ropes.

**CATALOGUE SECTION
PART III**

**Metals, Alloys and
Other Materials**

283

Pages 285-306

THE BUNTING BRASS & BRONZE CO.

729 SPENCER ST., TOLEDO, OHIO

Special Service for Engineers

The best thought and service of our experts is given freely, cheerfully, and promptly in supplying any information on any engineering problem involving finished bronze bushings or bearings.

If desired, our unbiased judgment and opinion covering any contemplated construction, which calls for bronze bushings or bearings, will be gladly submitted, including suggestions on proper alloys, etc.

BUNTING FEATURES

Quality products only. We make no other.

All bushings and bearings machined and completely finished, ready for use.

We make and list over eight thousand standard bushings and bearings. *Our catalog M contains valuable information.*

We work from blue prints, accurate dimensions or correct samples, prints preferred.

All work is carefully inspected in a specially organized department, so that Bunting products always go out *right*.

We confine our entire thought and skill to this one problem, which has made us, in the eyes of over 400 of the world's largest manufacturers, the foremost Bronze Bushing and Bearing authority.



BUNTING'S

Patented

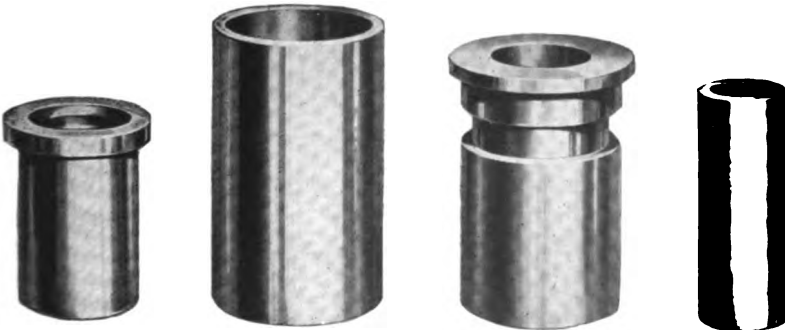
Finished

BRONZE

BUSHINGS

and

BEARINGS



A. ALLAN & SON

HARRISON, NEW JERSEY

Inventors and Sole Manufacturers of Allan Red Metal and Allan Bearing Bronze

BEARING BRONZE

The addition of lead to bronze, where same is accomplished by a process that will assure the casting of an alloy of uniform physical structure, a bearing bronze is produced that will have exceptional wearing and anti-friction qualities.

Allan Bearing Bronze is our lead-copper-tin alloy, made of the proper proportions of virgin metals, so alloyed as to assure a uniform physical structure. An exceptionally high grade bronze for high speed and heavy duty service. The bronze that will cut cost and upkeep on your mill pinions.

ALLAN RED METAL

286

This alloy is not strictly speaking a Babbitt metal, nor can it be classed as a bronze, it just fits in the intermediate field, to do such work where white Babbitt metals will not give satisfaction, as they readily change their form with an increase of temperature and yet conditions in many cases are such that it is impossible to use a bronze. Allan Red Metal combines the best qualities of the Babbitt and bronze alloys. It has the high anti-friction qualities of the Babbitt class with the temperature-resisting qualities of the bronze class.

Where will you find a bronze or Babbitt alloy that will stand up to the following service?

As shaft packing on steam turbines as a substitute for carbon.

As piston rod packing for locomotive service where temperatures run up to 650° Fahr.

As a bearing face for steam pistons with 150 pounds pressure and 200° super-heat.

Allan Red Metal for many years has been meeting these service conditions and also overcoming troublesome conditions in crank pin, crosshead and motor bearings where white Babbitt metals have proven inefficient for the service conditions.

A. ALLAN & SON



TRADE MARK



TRADE MARK

For over a quarter of a century we have been manufacturing bearing alloys, Allan Red Metal and Allan Bearing Bronze, our lead-copper and lead-copper-tin bearing alloys. They are made by The Allan Process, invented by Andrew Allan, Sr., in 1876. This is the only process which makes possible the alloying of lead-copper and lead-copper-tin in any desired proportion and assures the production of castings of uniform physical structure.

287

Our new plant at Harrison, N. J., is the highest attainment in foundry construction and equipment and is under able metallurgical and mechanical supervision.

No orders too large or too small for prompt attention.

Estimates gladly furnished from blue prints.

Alloys sold in ingots and castings.

On long runs we prefer to make the necessary patterns.

On short runs we prefer to work from customers' patterns or we can furnish the patterns at nominal cost.

AMERICAN BRONZE CORPORATION

GENERAL OFFICES AND WORKS:

BERWYN, PENNSYLVANIA

Manufacturers of "Non-Gran" High Speed Bearing Bronze

TESTIMONY EXTRAORDINARY

These extracts are taken from what is perhaps the most remarkable set of letters ever written in the interests of a government investigation of bearing bronzes. They point unmistakably to the high regard in which NON-GRAN is held by many of America's foremost manufacturers.

Long Life

"—up to the present day we have not a single record of ever replacing a cam shaft bearing or a valve guide bushing or any main bearing where the bronze material, NON-GRAN, was at fault."

Structure

"The freedom from granular structure in NON-GRAN Bronze Bushings has reduced shaft wear to a minimum."

Non-Scoring

"NON-GRAN Bronze Bushings will run hotter without scoring than any other bronze we have ever used. In fact, in our experience with NON-GRAN we have never had a scored bearing."

Economy

"—our shop losses due to defective bronzes of other makes have been so high as to force us to use NON-GRAN for conditions where a cheaper metal—were it reasonably sound—would otherwise satisfy our needs."

One Formula—

One Method—One Result

"The writer believes in the efficiency of strict specialization, as in the case of the American Bronze Corporation's determination to make the best bearing bronze possible."

Uniformity

"The homogeneity of NON-GRAN Bronze Bushings, their uniform quality and freedom from flaws and other defects have made them almost indispensable to our service."

NON-GRAN

AMERICAN BRONZE CORPORATION



Finished Bushings

We *specialize* on the finishing of plain straight bushings and plain straight bushings with flange at one end.

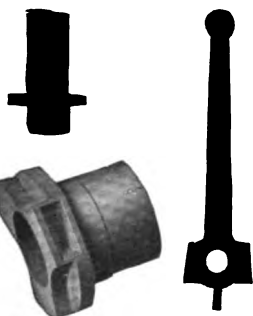
We undertake the finishing of these two specialties in long runs only.

We do not finish any shapes other than the above two, and we finish these only when the inside diameter is two inches or less.

Oil grooves, oil holes, slots, chamfers, etc., are provided as called for.

Our standard tolerances: $\pm .0005$ " on diameters; $\pm .005$ " on over-all lengths; $\pm .0025$ " on flange thicknesses. Work held to closer limits where required.

For quotations, note respective quantities on backs of your blue-prints. We furnish all necessary pattern equipment.



Castings

We cast NON-GRAN to any pattern of any size, with no cores, straight cores or intricate cores as required.

Use brass shrink rule and allow $\frac{1}{16}$ " stock all over for finishing on castings up to about 3"—more, in proportion, on larger castings.

On short runs we prefer to work from customers' patterns. On long runs we prefer to make the necessary pattern equipment.

For pattern work we charge merely our own costs for the labor and material involved.

All NON-GRAN Castings are sand-blasted and rigidly inspected before shipment.

We supply NON-GRAN Castings in any quantities from one up.

For quotations, send patterns or sketches and state quantities.

Standard 12" Bars

Outside diameters, $\frac{1}{2}$ " up to 5" by eighths.

Inside diameters, $\frac{1}{2}$ " up to 3" by eighths.

Supplied in any combinations of the above outside and inside diameters.



Write for list of standard combinations of O. D. and I. D. which are carried in stock for immediate shipment from Berwyn or from Official NON-GRAN Bar Distributors in all important cities.

Because of high tin contents NON-GRAN cannot be rolled or drawn but must be cast to pattern. In ordering NON-GRAN Bars therefore allow $\frac{1}{16}$ " stock all around to permit of your machining down to the finished dimensions of the part.

LUMEN BEARING COMPANY

BUFFALO

Brass Founders

The Lumen Bearing Company has enlarged its plant and increased its equipment with the object of being prepared for Government inquiries and orders.

Its organization, in general, is thoroughly familiar with the Government's alloys, specifications and methods of inspection and test, and capable of carrying out any contract which it accepts.

Its executives commit themselves to the advancement of the Government's interests in the present crisis, without reservation.

BAYONNE CASTING COMPANY

BAYONNE, N. J.

Monel Metal Castings: Rods, Bars, Wire (Round and Flat)
Monel Metal Forgings: Bolts, Nuts, Ribbon

What is "Monel Metal?"

It is a natural alloy of approximately 67% nickel, 28% copper, and 5% other metals (but containing no zinc, tin, or antimony). The refined metal has the strength of steel, resists corrosion and oxidation, withstands unusually high temperatures; is tough, ductile and has extreme tensile and torsional strengths.

It can be machined, forged, soldered, brazed, or welded by the electric or oxyacetylene process. Resembles pure nickel and takes the same finish.

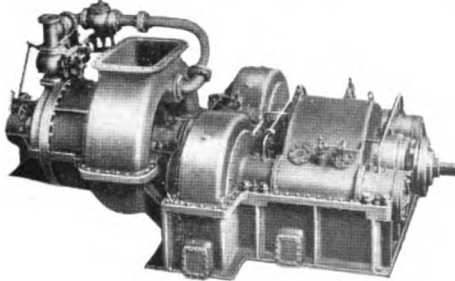
Without "MONEL METAL" the high efficiency of the modern power plant would not be possible.

SPECIFY "MONEL METAL"

instead of steel, manganese, tin or phosphor bronze, to all of which it is superior. Specify and use it for marine work, condenser parts, valve trim and parts subjected to superheated steam, hot gases, chemicals,

Consult Our Engineering Department

regarding your special problems. "MONEL METAL" has hundreds of applications in which no other metal offers equally desirable properties. Request our new treatise on "MONEL METAL," without which your technical library is not complete.



Turbine with "Monel Metal" Blading

etc.; turbine parts, packing house equipment, submarine parts, tie rods, dyeing and bleaching machinery, mining equipment, refrigerating and dairy machinery, numerous wire uses, etc. We make

CASTINGS FROM CUSTOMERS' PATTERNS

including one-piece castings up to 25,000 lbs. We supply "MONEL METAL" rods for bolt and nut stock, steam-turbine parts, drop-forging stock, motor-boat shafting, pickle pins, valve stems, etc.

291



Circulating and Air Pumps, Monel Metal Trimmed, for U. S. Destroyers. International Pump Co., Blake & Knowles Works

DOEHLER DIE-CASTING CO.

MAIN OFFICE AND EASTERN PLANT

BROOKLYN, N. Y.

Western Plant
TOLEDO, OHIO

New Jersey Plant
NEWARK, N. J.

Producers of Die-Castings in Brass and Bronze, Aluminum and White Metal Alloys; Die-Cast Babbitt and Babbitt-Lined Bronze Bearings



Die-Cast Bronze Gear

The importance of die-castings in present-day manufacture is now generally recognized throughout the various branches of the metal working industries. The economies effected by their use by delivering a finished part, however intricate in design, practically ready for assembling, requiring little or no machine finishing, and the increased production thereby made possible, are now well known.

Die-Castings, however, to satisfactorily perform the functions required of them, must possess certain requisites; lacking which, their use seriously jeopardizes the value of the product they are to become part of.

DOEHLER DIE-CASTINGS ACCOMPLISH EVERY ESSENTIAL DIE-CASTING REQUIREMENT. They are produced from high grade virgin metals of our own alloying by an organization whose sole aim for a decade has been the exclusive manufacture of die-castings, equipped with every facility for their successful production.

Aluminum Die-Castings



Aluminum Die-Cast Typewriter Part

By our development of the process for die-casting aluminum we immeasurably broadened the die-casting possibilities. The accuracy, uniformity and sharp outline that characterize our white metal products are also obtained in our Aluminum Die-Castings with the additional feature of a high tensile strength combined with lightness of weight. This product has within the last few years become an important factor in production economy, displacing to a great extent the use of machine finished parts where, owing to their limitations, white metal die-castings could not be satisfactorily employed.

Brass Die-Castings

Our most recent achievement, that of the development of the process for die-casting brass and bronze on a commercial scale, has been another step in the same direction—that has made this the leading and largest die-casting concern in the world.



Aluminum Die-Cast Balance Beam

STEWART MFG. CORPN.

4535-4551 FULLERTON AVE., CHICAGO

Manufacturers of Die-Cast Parts in White Brass and Aluminum Alloys; also Reinforced Babbitt Bearings



**DIE-CASTINGS
Of Quality**



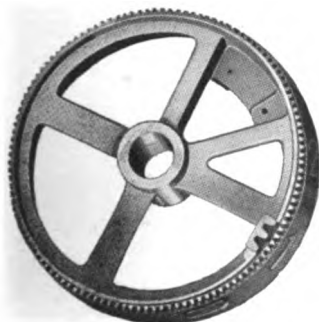
293

Die-castings made by the Stewart Process are superior in every way. They excel in strength, accuracy, uniformity and finish.

Stewart die-castings are made in white brass and aluminum alloys.

Advanced methods, combined with unlimited manufacturing facilities, including a large die-making department, enable us to make quick deliveries with large production.

It will pay you to investigate the Stewart Process.



ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

Manufacturers of

ALUMINUM

**Ingot, Sheet, Tubing, Wire, Rod, Rivets, Moulding
Extruded Shapes, Electrical Conductors**

General Sales Office

2400 Oliver Building

Pittsburgh, Pa.

Branch Offices

Boston, 131 State St.

Philadelphia, 1216-1218 Widener Bldg.

Chicago, 1500 Westminster Bldg.

Rochester, 1112 Granite Bldg.

Cleveland, 950 Leader-News Bldg.

San Francisco, 731 Rialto Bldg.

Detroit, 1512 Ford Bldg.

Washington, 417 Metropolitan Bank
Bldg.

Kansas City, 608 R. A. Long Bldg.

New York, 120 Broadway

CANADA

Northern Aluminum Co., Ltd.,
Toronto.

LATIN AMERICA

Aluminum Co. of South America,
Pittsburgh, Pa.

ENGLAND—Northern Aluminium Co., Ltd., London.

Send inquiries regarding aluminum in any form to nearest Branch Office, or to
General Sales Office.

THE AMERICAN BRASS COMPANY

WATERBURY, CONNECTICUT, U. S. A.

MILLS AND FACTORIES

Ansonia Branch, Ansonia, Conn.

Benedict & Burnham Branch, Waterbury, Conn.

Buffalo Branch, Buffalo, N. Y.

Coe Brass Branch, Torrington, Conn.

Kenosha Branch, Kenosha, Wis.

Waterbury Brass Branch, Waterbury, Conn.

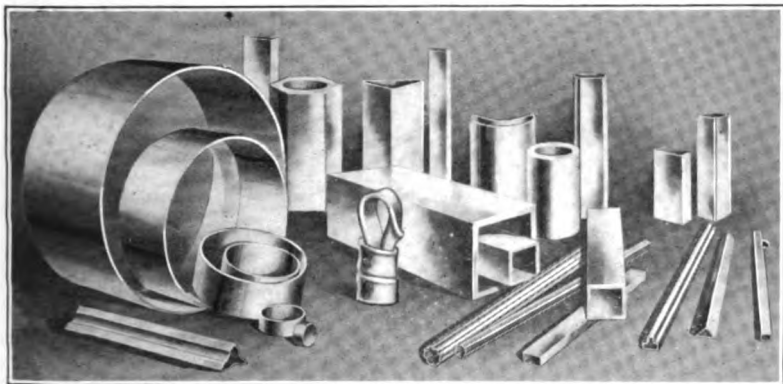
BRASS AND COPPER TUBES FOR EVERY ENGINEERING REQUIREMENT

Admiralty and other special grades of Condenser Tubes.

Ferrule Tubing, Heater Tubing, Pump Tubing.

Tobin Bronze and Phosphor Bronze Tubing for Bearings.

Brass and Copper Tubing in Iron Pipe and Plumbers' sizes.



295

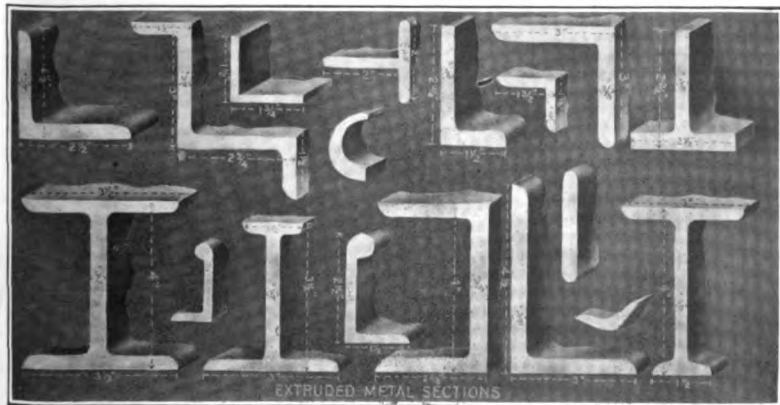
HIGH TENSILE STRENGTH RODS AND BARS ADAPTABLE FOR A GREAT VARIETY OF ENGINEERING PURPOSES

Tobin Bronze, remarkable for its Toughness and Resistance to Corrosion.

Free Cutting Rods, Naval Brass and Phosphor Bronze Rods.

Extruded Irregular Shaped Bars, Heavy Angles, Channels, and Mouldings made from forgeable alloys of both Brass and Bronze.

Turbine Blading and Calking Materials.



AMERICAN VULCANIZED FIBRE CO.

Established 1873

WILMINGTON, DELAWARE

VUL-COT FIBRE

(A higher development of vulcanized cotton fibre)

"Vul-Cot Fibre" is the trade name of an extra fine quality of vulcanized cotton fibre, manufactured by the first producers of this material in America—the holders of the original patents, and for many years, the sole American manufacturers.

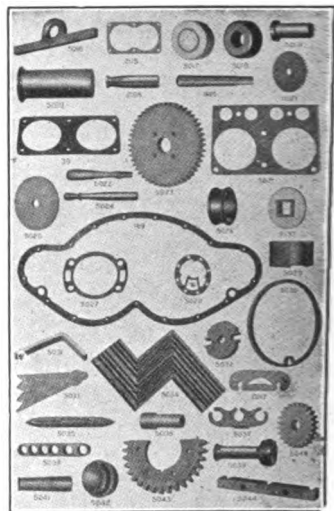
An experience, covering nearly a half century, has enabled them to produce a quality of fibre that is very hard and tough, pure in content and flawless in structure.

Only pure raw material is used, free from metal, bone and other foreign substances.

The manufacturing processes are carried out under skilled supervision of many years' experience. Each stage is accurately and scientifically controlled.

All traces of chemicals are removed. A rigid system of analysis, testing and inspection ensures this.

If you would be certain that the fibre used in your plant or product is the best quality obtainable, be sure that Vul-Cot Fibre is specified. It is sold in sheets, rods and tubes of all standard sizes, or finished parts machined to your order.



PHYSICAL PROPERTIES OF VUL-COT FIBRE

Tensile Strength	9,000–14,000 lbs. per sq. in.
Compressive Strength	32,000–37,000 lbs. per sq. in.
Resistance to Shearing	9,000–13,000 lbs. per sq. in.
Electrical Rupture	150– 400 volts per .001 thickness
Specific Gravity	1.2– 1.5

We maintain a department of engineers of wide experience to help you get the greatest good from the use of Vul-Cot Fibre. Put your problem up to them.

Samples, prices, etc., will be sent to you promptly upon request.

THE CONTINENTAL FIBRE CO.

NEWARK, DELAWARE

NEW YORK OFFICE
233 Broadway

PITTSBURGH OFFICE
301 Fifth Ave.

CHICAGO OFFICE
332 S. Michigan Ave

SAN FRANCISCO OFFICE
525 Market Street

LOS ANGELES OFFICE
411 South Main Street

The principal products of this Company are Vulcanized Fibre, Conite, Bakelite-Dilecto, Continental-Bakelite. Although manufactured primarily as Insulating Materials, their exceptional physical qualities render them adaptable to a wide range of Mechanical Applications.

BAKELITE-DILECTO

Bakelite-Dilecto is an insulating material made of paper laminations impregnated with liquid Bakelite pressed together and hardened. It is manufactured in the form of sheets and tubes. There are two sizes of standard sheets, 30" x 40" and 37" x 37" which may be obtained in any thickness from 0.005" to 3". Tubes are made 36" long with inside diameters of not less than $\frac{1}{4}$ " and outside diameters of not more than 6" with any wall thickness $\frac{1}{4}$ " and over.

While Bakelite-Dilecto is a laminated material the laminations are so thoroughly saturated with Bakelite that the resultant product is practically homogeneous. Its many remarkable qualities adapt it to a wide range of purely mechanical uses.

Bakelite-Dilecto may be easily sawed, filed, machined and drilled in any direction without splitting or cracking. It saws like bone and turns like a soft metal such as copper. It can be punched successfully up to $\frac{1}{8}$ " in thickness with a plain die. Drilling makes a clean smooth hole which taps easily leaving clean sharp threads.

The resistance to heat of Bakelite-Dilecto is remarkable. It will withstand a dry heat of 200° F. continuously and 300° F. for a short time without softening, blistering, cracking or change of shape.

When tested for mechanical strength Bakelite-Dilecto behaves in a manner similar to cast iron. It has an average tensile strength of 10,000 lbs. per square inch, and under compression will test up to 50,000 lbs. per square inch.

Special Shapes: Finished articles from Bakelite-Dilecto sheet or tube, completely machined to exact gauge ready for assembling, will be furnished in accordance with design. Quotations on finished or semi-finished articles together with samples of work done will be gladly submitted upon receipt of specifications. Inquiries for this class of work are solicited.

CONTINENTAL-BAKELITE

Continental-Bakelite is a laminated material made of cotton duck impregnated with liquid Bakelite pressed and hardened. It is made by the same process as Bakelite-Dilecto and may be obtained in the same sizes of sheets, rods, tubes and special shapes. It has the same physical and chemical properties but is somewhat weaker mechanically.

Gear Stock: The most important property of Continental-Bakelite is its extreme toughness which makes it an ideal material for noiseless gears. When meshed with a steel gear it takes up the shock because of its low modulus of elasticity of about 300,000 lbs. per square inch making a smooth and quiet running gear. Being absolutely water-proof will not soften or lose its mechanical strength under any weather conditions. The oil absorption is practically zero.

A gear made of Continental-Bakelite will, under ordinary conditions, take the place of a cast iron gear of the same size and have about the same life. The teeth of such a gear need no shroud, are stronger than, and will outwear the teeth of any other non-metallic gear.

We are also makers of high grade Vulcanized Fibre and Conite, the best thin fibrous insulating material.

DIAMOND STATE FIBRE COMPANY

BRIDGEPORT, PA.

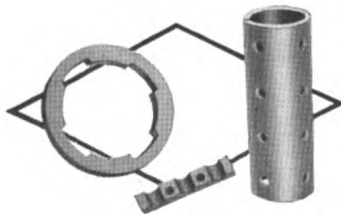
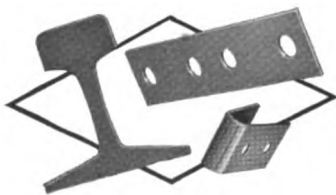
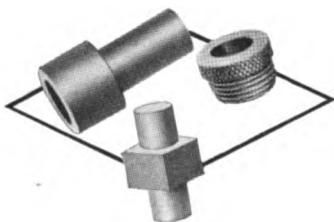
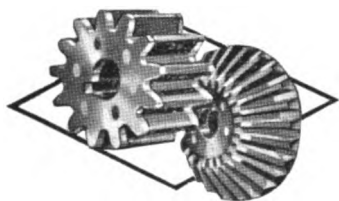
(Near Philadelphia)

OFFICES IN PRINCIPAL CITIES



A Mark of Quality

A Sign of Service



DIAMOND FIBRE

A Remarkable Material

Under the rapidly changing conditions surrounding all industry, hard or vulcanized fibre is developing widely expanded fields of usefulness, and our brand—Diamond Fibre—we think has special characteristics of superiority. Its adaptability for replacing materials which, through war conditions, have become either too scarce or too costly, is remarkable. There is scarcely an industry wherein Diamond Fibre cannot be used to advantage either in the manufacturer's product or in the tool equipment entering into the manufacturing.

Growing up with the great electrical industry and keeping step with the wonderful advancement in that field, vulcanized fibre has naturally developed to a state that gives it an ever-broadening influence in all lines of manufacture.

Our engineers have been particularly alert in developing and demonstrating new uses for Diamond Fibre, and we have in our own product a material that, owing to its great care in manufacture and its freedom from foreign substances, lends itself peculiarly to most intricate machining operations.

We manufacture Diamond Fibre in its three basic forms—sheet, rods and tubes. Also we have the equipment and make a specialty of machining gears, pinions, sprocket wheels, gaskets, cleats, ferrules, etc., to any specification.

Diamond Insulation and Disfco Insulation are two high-grade insulating papers possessing great bending qualities and high dielectric strength.

We have a Service Department which we invite you to use. We shall be pleased to send descriptive literature or enter into specific correspondence with reference to any manufacturing problem that you may have.

UNITED LEAD COMPANY

111 BROADWAY, NEW YORK CITY

Offices in All Principal Cities

Specialists in Lead Products

LEAD WOOL

LEAD ROPE

SHEET LEAD

**LEAD, TIN, BRASS AND COPPER LINED IRON PIPE
ACID RESISTING VALVES**

LEAD PIPE

TRAPS AND BENDS

TIN PIPE

ULCO LEAD ROPE: For making Metallic Packing we put up Lead Rope in smaller sizes. This material is sold lubricated or not, as requested. For stuffing boxes and valve stems the lead rope should be thoroughly saturated with graphite and oil. For making gaskets it is wrapped in cheese cloth and saturated with graphite and oil.

299

LEAD WOOL: For calking cast iron and riveted steel pipe for gas and water mains. Since it is not necessary to heat it, it cannot shrink like a cast lead joint. Used extensively for high pressure mains.

LINED PRODUCTS: Lead, tin, brass and copper lined iron pipe—Fittings, lead and tin lined, flanged or threaded. All of this class of products lined by the United process which inseparably bonds or fuses the two metals. Let us help you figure on your Water, Acid, or Food Product piping problems. Write for catalogue.

BABBITT METALS: All lead, tin, antimony, arsenic, copper alloys for use as Bearing or Casting Metals.

Write for catalogue of the particular product in which you are interested.

"Anything Made of Lead."

UNION DRAWN STEEL COMPANY

GENERAL OFFICES: BEAVER FALLS, PA.

WORKS: BEAVER FALLS, PA., and GARY, IND.

COLD DRAWN OR TURNED AND POLISHED	SHAFTING	{ Bessemer Open Hearth
	SCREW STEEL	
	ALLOY STEELS	{ Nickel—1% and 3½% Nickel Chromium Chromium Chromium—Vanadium, Etc.
	(Heat treated or not)	
	AXLES, PISTON RODS SPECIAL SHAPES SPECIAL CASE-HARDENING STEELS	

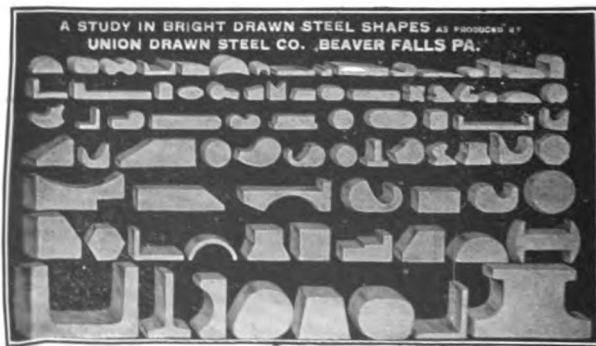
Cold Finished Bessemer, Open Hearth,
Crucible and Electric Furnace Steels

Shafting: We use only the best quality of Soft Steel and are manufacturing under recent patents, covering machinery and appliances, by a process superior to anything known for producing great accuracy, a highly polished surface and the necessary straightness.

Piston and Pump Rods: Of special steels up to 60 or 70 feet long.

Screw Steels: For Automatic machine uses at high speeds.

Elevator Guides: Cold Drawn, Straight, with matched joints.



Special Shapes of Cold Drawn Steel made to meet your specifications; often more economical than castings and forgings, where finished parts are needed.

Complete Warehouse Stocks Carried at

NEW YORK

DETROIT

CINCINNATI

PHILADELPHIA

CHICAGO

Branch Sales Offices at BOSTON and BUFFALO

WHEELOCK, LOVEJOY & COMPANY

NEW YORK
23 CLIFF ST.

CLEVELAND
1800 COLUMBUS RD.

CAMBRIDGE
128 SIDNEY ST.

Tool Steel for Every Purpose

Agents

THOMAS FIRTH & SONS, LTD.,
SHEFFIELD, ENG.

Cutlery and Saw Sheet Steel

GLOBE WIRE CO.,

SHARPSBURG, PA.

Polished Drill Rods, Needle Wire

Drawn Steel in Special Shapes

Agents

FIRTH-STERLING STEEL COMPANY,
PITTSBURGH, PA.

Makers Tool Steel

BRIGHTMAN MFG. CO.,

COLUMBUS, OHIO

Turned, Ground and Polished

Shafting and Screw Stock

HY-TEN STEEL

This steel is of high tensile strength and elastic limit, especially intended for machine tool parts where good wearing qualities combined with great strength and toughness are essential.

A complete stock is carried in warehouses for prompt shipment.

FIRTH-STERLING "BLUE CHIP" HIGH SPEED STEEL

Suitable for Lathe and Planer Tools, Milling Cutters, Drills, Reamers, Taps, Cutting and Blanking Dies, etc.

"Blue Chip" High Speed Steel is carried in stock in the following sizes and shapes:

SQUARES, $\frac{1}{4}$ in. to $\frac{3}{4}$ in. Hard Steel ready for use.

$\frac{3}{8}$ in. to 3 in. Annealed.

ROUNDS, $\frac{1}{16}$ in. to 10 in. Annealed.

FLATS, $\frac{3}{8}$ in. x $\frac{1}{4}$ in. to $5\frac{1}{2}$ in. x $\frac{1}{4}$ in. Annealed.

$\frac{1}{2}$ in. x $\frac{1}{4}$ in. to $3\frac{1}{8}$ in. x 2 in. Annealed.

Special sizes can be secured promptly from the mill.

FIRTH-STERLING TOOL STEELS

Other high-grade Firth-Sterling Steels carried in stock by Wheelock, Lovejoy and Company are in part as follows:

Firth's Best Tool Steel (Water Hardening), a strictly high grade carbon tool steel for general service.

Firth-Sterling Special Steel. For Punches, Dies, Chisels, Blacksmith Tools, Shear Blades, Rivet Snaps and all Shop Work.

Sterling Tool Steel. This steel is made to compete with the lower grades on the market, and will compare favorably with them. Carried in stock in Rounds, Flats, Squares and Octagons.

ALLOY STEELS

To meet the increased demand for steels that are more effective than carbon steels, and of a different character from High Speed Steel, we have developed the following which we now recommend for various purposes:

Firth-Sterling "Extra Special" Steel
Firth-Sterling "Double Special" Steel
"Hold Fast" Magnet Steel

"C Y W Choice" Steel
"A W Special" Steel
Firth-Sterling Finis Steel

UNION DROP FORGE COMPANY

358 WEST GRAND AVE., CHICAGO, ILL.

Manufacturers of Drop Forgings and Ground Crankshafts

COUNTERBALANCED CRANKSHAFTS Drop-Forged In One Piece



We are prepared to furnish Drop Forged Crankshafts with Counter Weights forged integral either in one or multiple cylinder shafts. Crankshafts forged by our process eliminate the possibility of the Counter Weights becoming loose or flying off which might occur if the Counter Weights are not forged integral (from one bar). We can forge and finish complete your Crankshafts as we operate a large Grinding Department in conjunction with our Forge Department, which will save you delay and expense, in that the forging is produced and finished in the same plant.

All steel received at our Works, either Simple Forging or Alloy, is systematically and carefully analyzed by Chemists of National Repute and our Heat Treating Department is under the most competent management. We, therefore, are prepared to furnish you Economically the best Crankshaft it is possible to produce.

This statement will apply to all Drop Forgings made by Union Drop Forge Company requiring Accuracy, Quality of Steel and proper Heat Treating.

VULCAN STEAM FORGING CO.

247 RANO STREET, BUFFALO, N. Y.

Makers of High Grade Forgings



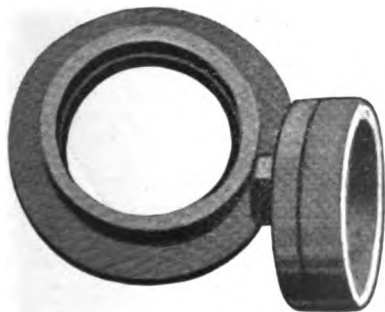
**SPECIALISTS IN
DIE MAKERS FORGINGS**

**MAKERS OF EVERY TYPE OF
MACHINE FORGING**

We can afford you quick service in smooth forged crucible tool steel Cutting and Draw Die Weldless Rings, Circular Cutters, Shear Blades, Composite Dies and Punches and every other type of forging used by Die Makers. Our crucible steels comprise Standard, Extra and Special grades, including an Oil-Hardening, Non-Shrinking Tool Steel.



Made of open hearth carbon steels, we quickly furnish light and medium weight smooth forged Crankshafts, Spindles, Levers, Cutterheads, Gauge Rings, Shafting and all Machine Parts. We keep complete stocks, guaranteed in analyses, in carbon ranges of .08 to .65.



Our Alloy Steels, 3¼% Nickel and Chrome-Nickel, are of analyses that, under recommended treatment, will give the highest physical qualities for Gears, Axles, Spindles, Reamer Bodies or other Machine Parts requiring hardness or maximum strength.

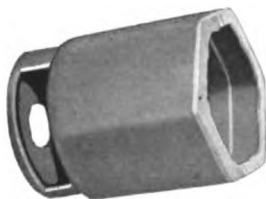
THE BOSSERT CORPORATION

UTICA, N. Y.

Manufacturers of Sheet Metal Stampings

BOSSERT STAMPINGS

We are exceptionally well equipped for the manufacture of all kinds of sheet metal stampings from the smallest to the very heaviest and largest, as our equipment includes the largest mechanical presses in the world, both single and double action presses, as well as single and double crank.



Our longest range of work is about 8' by about 5' wide; round work we can go up to about 5' in diameter up to $\frac{3}{4}$ " thick and up to 6 and 7' in diameter up to $\frac{1}{4}$ " thick.

We have had our equipment of presses built for large and heavy work, anticipating the probable future requirements of pressed steel parts on a much larger and heavier scale than they are being produced today, to take the place of all kinds of castings, forgings and work turned from the bar.

We make a specialty of Automobile and Tractor Axle and Wheel Parts.

With the largest presses in the industry and a complete and modern plant for annealing, case hardening, nickel plating, electric and oxy-acetylene welding, we solicit your inquiries and orders.



WORCESTER PRESSED STEEL CO.

Factory and Main Office

WORCESTER, MASS.

NEW YORK SALES OFFICE
30 Church St.

CHICAGO SALES OFFICE
1243 Peoples Gas Building

Light and Heavy Metal Stamping



HIGHEST QUALITY LIGHT AND HEAVY METAL STAMPING

Deep Drawing, Cold Rolling, Cold Forging, Pressing

Our entire organization and equipment, developed by 30 years' experience, are devoted exclusively to making special stamped parts for others from strip and sheet steel, brass, bronze, copper, aluminum, silver, monel metal and the new steel alloys. We make all of our own tools. We pickle, oil, shear and cold-roll our own steel.

305

SHEET METAL PARTS TO ORDER FOR

Automobiles	Motorcycles	Roller Skates
Textile and	Bicycles	Ice Skates
Electrical Fittings	Cream Separators	Pruners
Vacuum Cleaners	Ball Bearings	Telaugographs
Shock Absorbers	Calculators	Dictographs
Typewriters	Phonographs	Handles
Telephones	Sheet Metal Specialties	Bowls
Flanges	Pulleys	Guards
Brackets	Retainers	Brake Drums
Wrenches	Cups	Axle Boxes
Discs	Hubs	Looms
Caps	Cases	Clutch Discs
Shims	Lawn Mowers	Stampings

We also have one of the most completely equipped COLD ROLLED STRIP STEEL MILLS in the East, having a capacity of 1500 tons per month and producing strip steel up to 12' in width and from .005' to .375' in thickness.

THE OHIO STEEL FOUNDRY CO.

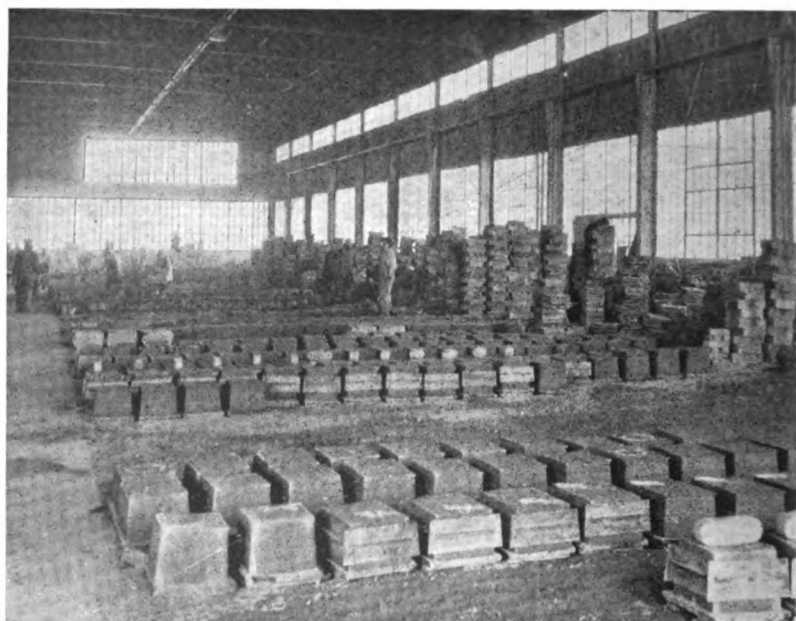
SPRINGFIELD, OHIO

PLANTS

LIMA, OHIO

BUCYRUS, OHIO

SPRINGFIELD, OHIO



306

We are specialists in making steel castings. Castings, of course, like everything else, come in different grades. We can not make all the castings required, so we make the best.

Just the right analysis and perfect annealing give Ohio castings the power to resist cracking. Exceptional care is also taken to give them a fine finish. Special attention is given to small castings, at our Springfield plant, for use in tractors, trucks and trailers.

Send us your blue-prints. We can make prompt deliveries on the best steel castings when you need them.

**CATALOGUE SECTION
PART IV**

**Metal Working Machinery
Machine Tools and Accessories
Shop Equipment**

307

Pages 309-424

THE LONG & ALLSTATTER CO.

Established 1856

Incorporated 1878

HAMILTON, OHIO, U. S. A.

Manufacturers of Power Punches and Shears

THE QUALITY LINE

Punching, Shearing and Forging Machines and Machinery Equipment for Shipyards, Steel Car Plants, Rolling Mills, Bridge and Structural Iron Works

PUNCHING MACHINES SHEARING MACHINES

A complete line of open-throated type, large and small, single- and double-ended, belt, steam or electrically driven (customer's option); a carefully graduated schedule for general purpose use, with modifications in endless variety for special work of all kinds.

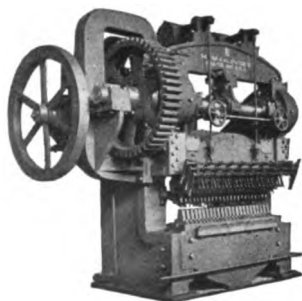
MULTIPLE PUNCHES GATE SHEARS

Varying in width between housings and depth of throat to suit customer's requirements; to punch any number of holes, in groups or in rows, with fixed or adjustable centers, or cut off and trim plates or sheets of any width or thickness.

COPING MACHINES STRUCTURAL PUNCHES

A full line, for coping and punching large and small structural sections (beams, channels, angles, etc.) of all kinds and sizes with the widest range of equipment.

Write us regarding your problems in punching and shearing—correspondence solicited. Estimates furnished on request. If interested, you may have a catalogue for the asking.



Multiple Punch



Structural Iron Punch



Horizontal Punch and Bending Machine

E. W. BLISS COMPANY

MAIN OFFICE AND WORKS: BROOKLYN, N. Y., U. S. A.

CHICAGO

DETROIT

CLEVELAND

LONDON

PARIS



"BLISS" INCLINABLE POWER PRESSES—18 sizes, weighing from 500 to 8,000 lbs., either as "Flywheel" or "Geared" Presses. Adapted for tin, sheet brass, sheet steel work, etc.

PRESSES, DIES, SHEARS,
DROP HAMMERS,
DOUBLE SEAMERS,
SPECIAL MACHINERY

1857

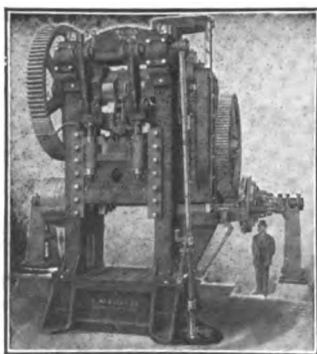


1918

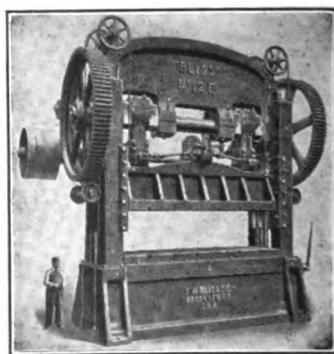


"STILES" AUTOMATIC DROP HAMMERS—Built in 15 sizes. Adapted for forging or stamping. Hammers weigh from 100 to 3000 lbs.

Tin and Enamel ware Machinery
Metal Package Machinery
Automatic Tin Can Machinery
Electrical Parts Machinery
Automobile Parts Machinery
Drop Forging Machinery



"BLISS" TOGGLE DRAWING PRESSES—Built in over 20 sizes, weighing from 5,600 to 165,000 lbs. For drawing shells from all kinds of sheet metal.



"BLISS" STRAIGHT-SIDE DOUBLE CRANK PRESSES—Built in over 150 different types and sizes, weighing from 2,500 to 260,000 lbs. For heavy blanking, stamping and punching of large dimensions.

"BLISS" DOUBLE SEAMERS (not illustrated)—Built in over 30 different types and sizes, weighing from 275 to 7,500 lbs. For double seaming the tops and bottoms on articles of square, round, oval and irregular shapes.

"STILES" PUNCHING PRESSES (see opposite page)—11 sizes, weighing from 550 to 13,000 lbs. Adapted for the manufacture of general hardware, electrical goods, etc.

"BLISS" KNUCKLE JOINT EMBOSSING PRESSES (see opposite page)—Built in 12 sizes and various styles, weighing from 2,700 to 110,000 lbs. and capable of exerting pressures ranging from 30 to 1,500 tons.

"BLISS" AND "STILES" OVERHANGING DOUBLE-CRANK PRESSES (not illustrated)—Built in over 100 different types and sizes, weighing from 2,300 to 280,000 lbs. For heavy blanking, stamping and punching of large dimensions, etc.

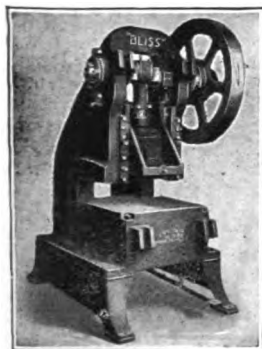
Catalogue of any line of our machines sent on request.

E. W. BLISS COMPANY

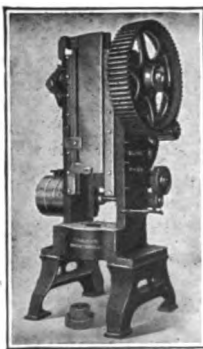
Our Product Includes **MACHINERY AND DIES** for the Economical
Manufacture of the Following Sheet Metal Goods:

Agricultural Implements	Drip Pans	Lamps	Roofing
Albums	Door Knobs	Lanterns	Rubber Cups
Aluminum Ware	Drop Forgings	Lard Pails	Satchel Frames
Armature Disks and	Druggists' Tinware	Locks	Speaking Tubes
Segments	Dust Pans	Match Boxes	Silver Ware
Automobile Parts	Electrical Goods	Meat Cans	Sheet Steel Sinks
Bicycle Parts	Elevator Buckets	Medals	Shingles (Metal)
Bird Cages	Enamel Ware	Metallic Ceiling	Shovels
Bottle Caps and Capsules	Expanded Metal Laths	Metal Laths	Spoons
Brass Goods	Fish Cans	Metal Radiators	Sheet Steel Stoves
Brittania Ware	Forks	Musical Instruments	Steel Barrels
Buckles	Fruit Cans	Oil Cans	Stove Trimmings
Burners	Fry Pans	Oil Stoves	Thimbles
Butter Tins	Furniture (Metal)	Perforated Metal	Tin Boxes and Cans
Cash Registers	Gas Fixtures	Paint Cans	Tobacco Boxes
Cigarette Boxes	Gas Ranges	Paint Tubes	Toys
Clocks	Gongs	Petroleum Cans	Trunk Trimmings
Coal Hods	Gun Parts	Pick-eyes	Typewriters
Collapsible Tubes	Hammers	Pieced Tinware	Vapor Stoves
Cooking Utensils	Hardware	Plated Ware	Varnish Cans
Coins	Harness Trimmings	Playing Cards	Vegetable Cans
Cornice Work	Hinges	Powder Kegs	Water Coolers
Cuspidors	Horse Shoes	Range Boilers	Water Pails
Cutlery	Jewelry	Range Parts	Watches
Dental Instruments	Kitchen Boilers	Reflectors	Wash Tubs
Dinner Pails	Kitchen Utensils	Refrigerators	Zinc Work

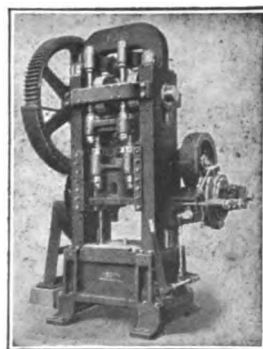
And Many Other Staple and Special Lines of Goods



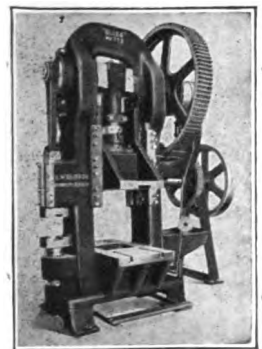
Cut Back Frame



Reducing Press



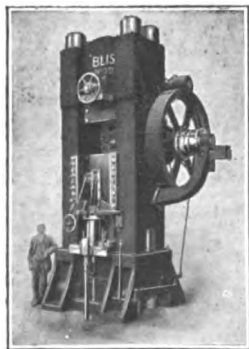
Double Action Cam



Trimming Press



"Stiles" Deep Throat



Knuckle Joint

NIAGARA MACHINE & TOOL WORKS

BUFFALO, N. Y., U. S. A.

Tools and Machines for Working Sheet Metals, Presses and Punches, Power Shears, Tinsmiths' Tools, Forming Rolls, Etc.

Furnishing Tinsmiths, Sheet Iron Workers, and Sheet Metal Goods Manufacturers, the proper tools and equipment for efficient production, has been for forty years the exclusive work of this company. It offers machines for folding, bending, curving, crimping, beading, flanging, grooving, seaming, blanking, punching, perforating, forming, stamping, drawing, shearing, and other operations in Sheet Metals; hand tools, hand operated, and high production machines.

Competent Engineers are at your service. Inquiries are solicited.



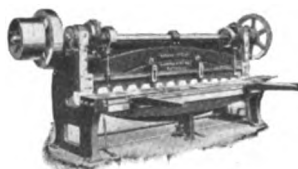
No. 615 E Press

PRESSES

Inclinable, Punching, Horning and Wiring, Arch, Straight Sided, Single Crank, Double Crank, Trimming, Toggle Drawing, Cam Drawing, Reducing, Screw, Foot, Drop, Bench and other types; built in sizes up to 75,000 lb. weight, for light or heavy sheet metal punching, cutting, blanking, bending, forming and drawing, also for trimming drop forgings.

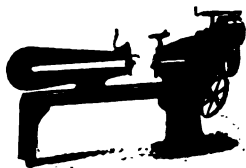
SHEARS

SQUARING Shears, foot operated, belt or motor driven; made in a full range of lengths from 2 to 16 feet, for any thickness of material up to and including three-eighths inch; with or without gap. Niagara Shears make straight, accurate cuts the full length of the Shear. The gap is necessary for shearing sheets longer than the machine.



No. 8120 Shear

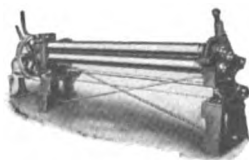
ROTARY Shears, hand operated, belt or motor driven; built in many sizes; for light gauge, up to one-half inch capacity; with various depths of throat; in both ordinary, and ring shear, or internal circle types; with circle arm for cutting discs and rings, or arranged for straight slitting, irregular cutting, etc.



No. 16 A Ring Shear

FORMING ROLLS

Our Slip Roll Formers are made in diameter $1\frac{1}{4}$ " to 7"; lengths up to 10 feet; capacity up to $\frac{3}{8}$ "; for curving Sheet Metal, or forming to cylindrical shape; ordinary construction or with special features to suit requirements.



6'x120' Slip Roll

SHEET METAL WORKERS' TOOLS

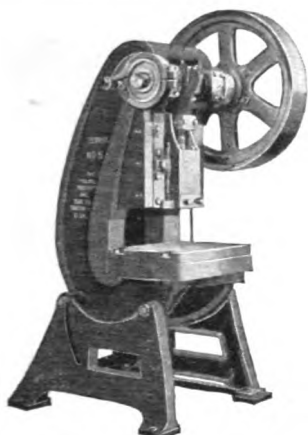
Folders, Brakes, Beaders, Crimpers, Flangers, Groovers, Double Seamers, Elbow Machines, Stakes, Snips, Bench Shears, Rivet Sets, Hand Tools, Roofers' Tools, Notchers, Lever Shears, and Lever Punches, all in great variety of size and type.

Complete catalog upon request.

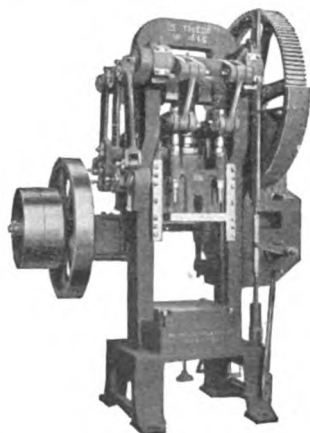
THE TOLEDO MACHINE & TOOL CO.

TOLEDO, OHIO, U. S. A.

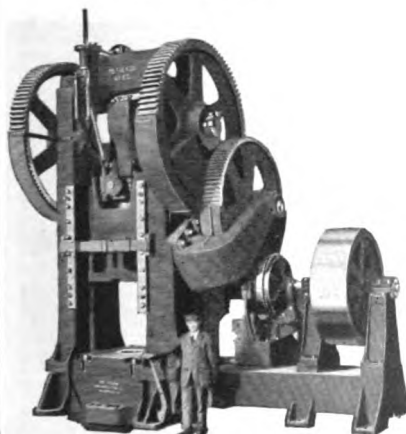
Presses, Dies, Shears, Drop Hammers and Kindred
Sheet Metal Working Machinery



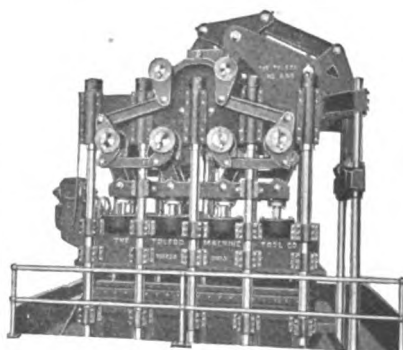
The "Toledo" Open Back Presses
Series Nos. 1 and 70, 30 sizes
500 to 60,000 lbs.
Section No. 2



The "Toledo" Toggle Drawing Presses
Series No. 160, 50 sizes
7500 to 650,000 lbs.
Section No. 8



The "Toledo" Arch Presses
Series No. 50, 65 sizes
3000 to 400,000 lbs.
Section No. 6



The "Toledo" Rail Forming Presses
Series No. 890, 4 sizes
350,000 to 750,000 lbs.
Section No. 8

Three Thousand Patterns from which to choose

Correspondence Solicited.

Estimates Furnished.

WILLIAMS, WHITE & CO.

MOLINE, ILLINOIS, U. S. A.

PITTSBURGH OFFICE
808 House Building

NEW YORK OFFICE
C. H. Holbrook
30 Church St.

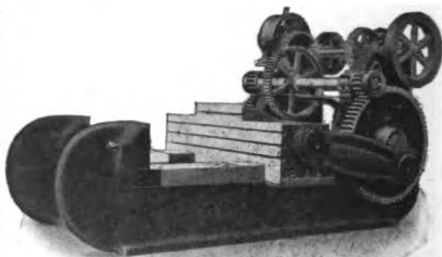
DETROIT OFFICE
J. C. Austerberry
924 Dime Bank Bldg.

CHICAGO OFFICE
933 Monadnock Block

Forging, Punching and Shearing Machinery; Coaling Stations

BULLDOZERS: Nearly forty years of Bulldozer manufacturing. These machines are used for an incredible number of purposes. General purpose Press with practically unlimited possibilities. Built in ten sizes, and two types.

YEAKLEY VACUUM HAMMERS: Recent and important improvements place this hammer at the head of Forging Hammers, both in power and control. Speed of blow is maintained, forging both light and heavy. Built in sizes from 40 to 650 lbs. Adaptable to motor drive.



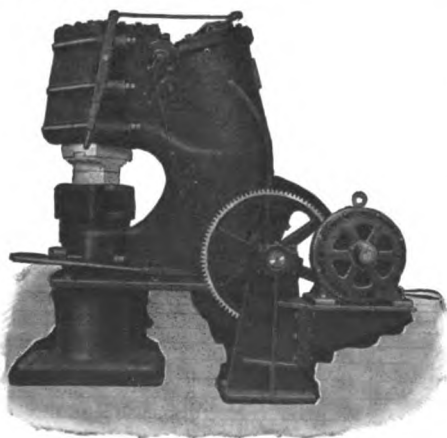
Bulldozer

JUSTICE SPRING HAMMER: Silico manganese steel springs furnished.

MOLINE HELVE HAMMER: Extra heavy in design.

BOARD DROP HAMMER: Very much improved. Exceptionally easy of operation and large output.

CRANK (OR ROPE LIFT) DROP HAMMERS: Stand very severe service with comparatively small upkeep. Particularly adapted to the carrying of large dies, for bending, shaping, forming and straightening. Made in three styles of Lifters—Sandage, Ratchet and Peck.



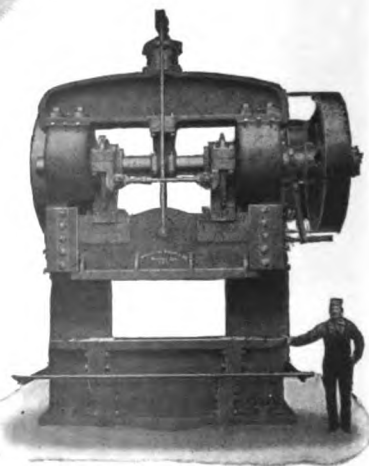
YEAKLEY Hammer

MULTIPLE PUNCHES: These machines are made in nine sizes with varying lengths and throats. Special adaptations for special work furnished. Machines range in weight from 5,000 to 250,000 lbs.

PUNCHING AND SHEARING MACHINES "C" type, Double and Single End Machines. Open-fronted Bar Shears, and Guillotine Shears.

COPING AND STRUCTURAL PUNCHES AND SHEARS: Complete line of the above machines, covering a wide range of throats, capacities, types of jaw, equipment, etc.

Our Line Also Includes: Upsetting, Forging and Rivet Machines, Eye Benders, Multiple Head Tapping Machines, Bending and Straightening Machines, Horizontal Punches, Hydraulic Presses, Power and Trimming Presses, Stay Bolt Breakers, Rotary Riveting Hammers, Angle Bending Rolls and Angle Shears.



Multiple Punch

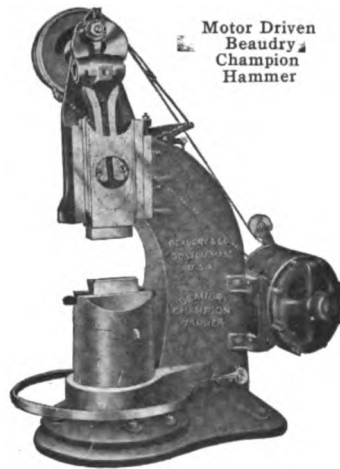
BEAUDRY & COMPANY, INC.

141 MILK ST., BOSTON, MASS.

Manufacturers of Baudry Power Hammers (Belt or Motor Driven)

BEAUDRY CHAMPION HAMMERS are built in sizes from 50 to 500 lbs. weight of ram. They are designed for light and heavy railroad, machine, and general blacksmithing; for swaging, collaring, drawing, plating, spindle-making, and general manufacturing. They will handle varying thicknesses of stock without change of adjustment and combine quickness of action with a powerful blow.

The Baudry Champion Power Hammer has many claims to favor, but its foremost claims are *elasticity, control, and force of the blow struck by it*. These are obtained by a device which is simple, direct-acting, and effective, allowing the ram the greatest freedom of throw and causing it to rebound the instant the blow is struck. Its ram, or "Head," is of steel and has an internal elliptical-shaped track. Two steel spring arms, with hardened tool steel rollers at their lower extremities, operate within the ram, upon the curved track, and serve to lift and throw the ram, which, with increased speed of hammer, acquires increased travel and force of blow. This simple and positive action of the spring arms perfectly controls the ram and causes it to rebound the instant the blow is struck without reaction or jump or sudden undue strain on any of the hammer parts.



Motor Driven
Baudry
Champion
Hammer

315

SIZES AND DIMENSIONS CHAMPION POWER HAMMER

No. of Hammer	2	3	4	5	6	7	8	9	11	12
Weight of Ram, lbs.	60	75	100	125	150	200	250	300	400	500
Estimated Force of Blow, lbs.	300	460	600	750	900	1200	1500	1800	2400	3000
Lift of Ram, inches	6	7	8	8½	9	10	11	11½	12½	13
Average Size of Work, inches	1½	1¾	2¼	2½	3	3½	4	4½	6	6
H. P. of Motor	3 H.P.	3 H.P.	5 H.P.	5 H.P.	6 H.P.	7½ H.P.	7½ H.P.	7½ H.P.	10 H.P.	10 H.P.
Speed of Motor when directly attached to Hammer Frame	900	900	900	900	900	850	850	850	850	850
Speed of Hammer	300	300	275	275	250	225	225	200	175	175
Diameter of Driving Pulley, inches	14	14	16	16	17	18	18	19	20	22
Face of Driving Pulley, inches	3	3	3½	3½	4	4	4½	5	6	7
Approx. Weight of Hammer, lbs.	2000	2400	3000	3200	3700	4400	4800	5400	7000	8000

Bars of Any Length May Be Worked Either Way of Dies

Motor Driven Hammers: Baudry Champion Hammers are readily arranged for motor drive. We are prepared to quote on these hammers complete with motor, or we will quote on hammers arranged for motor drive, customer to supply his own motor.

Our new Catalog will interest you. Gladly sent on request.

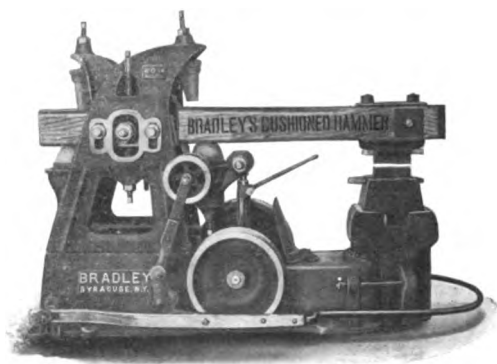
C. C. BRADLEY & SON, INC.

Established in 1832

SYRACUSE, N. Y.

Manufacturers of Bradley Cushioned Power Hammers and Forges

THE BRADLEY Rubber Cushioned HELVE HAMMER



316

BRADLEY HAMMERS are made in Helve, Upright Strap, Upright Helve, and Compact styles, with heads ranging from 15 lbs. to 500 lbs., and capable of forging iron, steel and other metals from five inches square down.

If your work is continuous, like plating, drawing, swaging, collaring, welding or spindle work, with infrequent changes in size of material, or if it is die work where perfect accuracy and the finest finish are imperative, let the Bradley Helve Hammer be your choice. No other Hammer is like it. No other Hammer can equal it.

If your work is of a general, all-around jobbing character, with frequent variations in the size of stock, or is of such a nature that the Hammer is not worked continuously, but with frequent stops, a Bradley Upright Hammer may best answer the purpose.

If your work is such as described last above, and your floor space is limited, but with good height, and a somewhat less first cost is an object, we suggest the Bradley Compact Hammer.

DON'T GIVE THE FIRST COST of a Hammer too much prominence. The question of greater output, uninterrupted work, reduced cost for repairs and greater durability, are of more importance. Any excess in price of Bradley Hammers over others, is more than made up in the Hammers themselves.

More Bradley Hammers are sold each year than of all other power Hammers combined. Separate circulars of each.

WE MAKE

The Bradley Cushioned Helve Hammer

The Bradley Upright Helve Hammer

The Bradley Upright Strap Hammer

The Bradley Compact Hammer

Forges for Hard Coal or Coke

NAZEL ENGINEERING & MCH. WORKS

4040 N. 5TH ST., PHILADELPHIA, PA.

Manufacturers of Pneumatic Power Hammers For Belt or Direct Motor Drive

THE NAZEL HAMMER

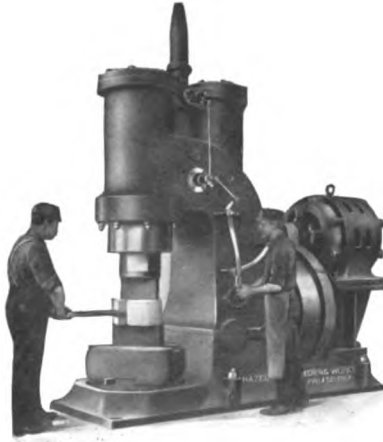
The special feature of The Nazel Hammer is, that it is self-contained, using the air at the temperature which it attains in compression and, as its expansion is almost perfect, it gives up nearly the full power that is put into it in compression.

This hammer is built in sizes from 75 lbs. to 850 lbs. This rating is purely arbitrary and is the same as used generally by hammer manufacturers, being the weight of the falling parts ram and die.

It is impossible to definitely rate hammers with respect to size of work, as so many factors enter into the problem, that any rate given for one would not apply to all; however in relation to ram weight these hammers have a far greater capacity than any other type, and while the capacities of hammers as specified are conservative, when making inquiries, the nature of the work, the largest as well as the average size and kind of material to be hammered should be given, to enable us to select the size hammer most suitable for the work.

Its Features

Hammer & Compressor Combined.
Simple Durable Construction.
Powerful Clinging Blow.
Positive Control.
Variable Blows at Will without adjustments or change of speed.
Holding Ram Suspended or Compressed.
Long Ram Guide.
Suitable Speed.
Minimum Power with Highest Possible Efficiency.
Belt Drive, No Countershaft.
Motor Drive, Geared Direct.
Power Consumed only when Running.



No. 6 Hammer Motor Driven

SPECIFICATIONS

Sizes	1	2	3	4	5	6
Size of Material Worked Efficiently . . .	2"x2"	3"x3"	4"x4"	5"x5"	6"x6"	7"x7"
Blows per Minute . . .	220	210	180	150	130	120
Maximum horse power required . . .	2.5	8.3	10.3	15	23.5	34.4
Requisite Motor (horse power) . . .	3	7.5	10	15	25	35
Desirable Motor Speed . . .	1200	1100	1000	900	800	700
Stroke of Ram . . . Inches	11	14	15½	19½	23½	27½
Center of Ram to Housing . . . "	10½	12½	13½	14½	16½	20½
Clear Working Space . . . "	8	10	14½	15½	17	22
Floor Space Required . . . "	67x28	75x30	87x33	94x37	110x43	118x47
Weight of Hammer Complete . . . Pounds	4840	7050	10500	13640	20900	32000

Write for The Nazel Hammer Book. It's Interesting.

ATLAS PRESS COMPANY

310 No. PARK ST., KALAMAZOO, MICH., U. S. A.

Manufacturers of Atlas Compound Mandrel Presses

EFFICIENT ARBOR PRESS EQUIPMENT

ATLAS PRESSES are built in all sizes and types for driving mandrels, bending and straightening, broaching, embossing with dies, setting bushings, etc. In fact all work requiring pressure up to 25 tons and centering capacity up to 38 inches may be done quicker and easier on our *Compound Presses* than by any other method.

Pinions are cut from forgings of Chrome Vanadium—Rams from specially treated Chrome Nickel. All parts designed to give highest degree of efficiency under all service conditions. *Complete details upon request.*

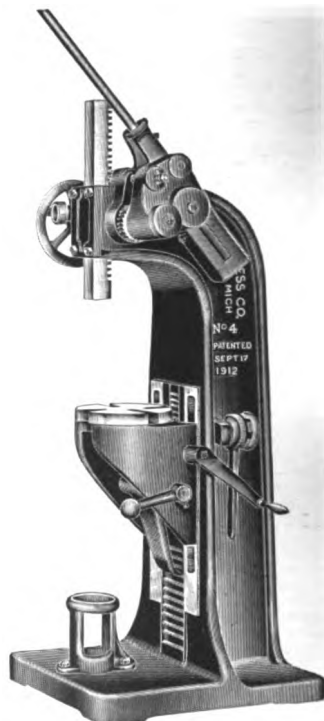
Carried in stock by leading machinery dealers everywhere.



No. 24 Press



No. 3 on Stand



No. 4 Press

THE ACME MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

Code Word: ACME

Lieber's Code

Builders of Turret Machinery

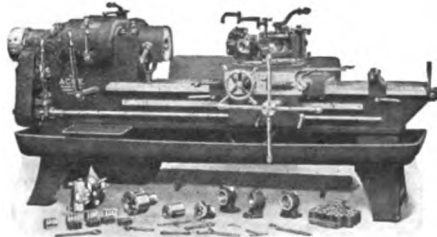
CINCINNATI ACME

41 TURRET LATHES, SCREW MACHINES, TURRET LATHES, BRASS WORKING MACHINES, UNIVERSAL TURRET LATHES, AND ALL TOOL ACCESSORIES

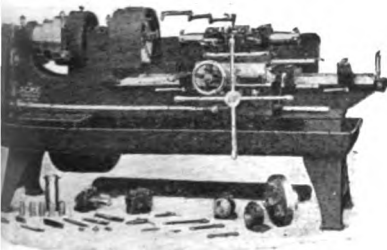
FLAT TURRET LATHES, the double purpose machines. Adapted to both bar and chucking work. Using simple, inexpensive tools. The greatest producers of work from bar stock, forgings and castings. Capacity bar stock $2\frac{1}{4}$ " to $3\frac{1}{2}$ " and chucking work 12" to 17" diameter.



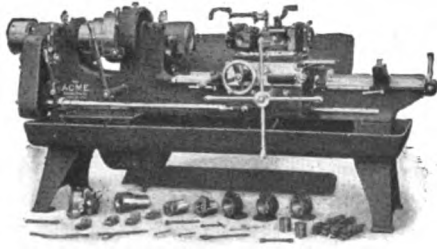
No. 3 Universal Flat Turret Lathe with Chucking Equipment



$3\frac{1}{4}$ " x 36" Flat Turret Lathe with Bar Equipment

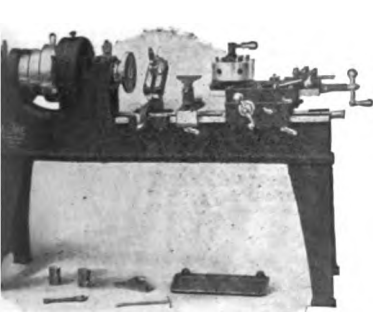


$2\frac{1}{4}$ " x 26" Flat Turret Lathe with Chucking Equipment

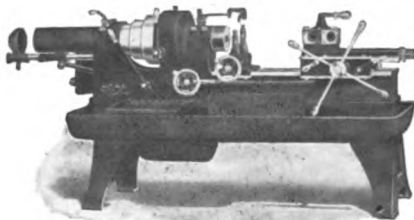


$2\frac{1}{4}$ " x 26" Flat Turret Lathe with Bar Equipment

TURRET LATHES AND BRASS WORKING MACHINES made in four sizes. 14" to 20" swing. Plain or friction geared head, with or without automatic chuck, bar feed, automatic feed to turret, cut off rest. Furnished with plain, set over or universal turret, also chasing attachment, forming attachment and all tools for rapid and accurate production.



16" Universal Turret Lathe



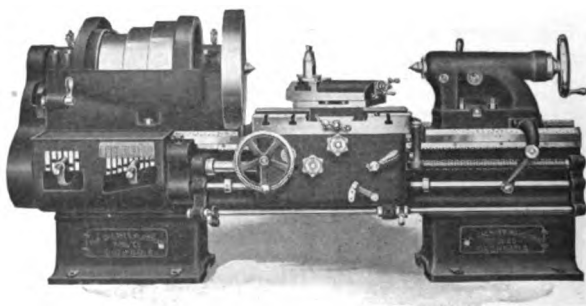
$2\frac{1}{4}$ " x 11" Screw Machine

SCREW MACHINES made in five sizes. Automatic Chuck capacity $\frac{3}{8}$ " to $2\frac{1}{4}$ ", 11" to 20" swing. Plain or friction geared head with or without automatic feed to turret.

THE GREAVES-KLUSMAN TOOL CO.

CINCINNATI, OHIO

Manufacturers of Engine Lathes



20" Heavy Quick Change Three Step Cone Friction
Double Back Gear Lathe

THE G-K WAY

The prime object in the design and construction of G-K Lathes is to give to their users a machine that will meet every requirement accurately, rapidly and give greatest convenience in operation.

320

This is accomplished by devoting our entire energy and equipment to the manufacturing of Engine Lathes. Our long experience in this line enables us to offer machines of the highest type and efficiency for the increasing demands of up-to-date shop practice.

We build a complete line of Engine Lathes, from 16" to 30" inclusive. Our 16" and 18" Lathes are built with three styles of Headstock:

Four Step Cone Single Back Gear.

Three Step Cone Friction Double Back Gear.

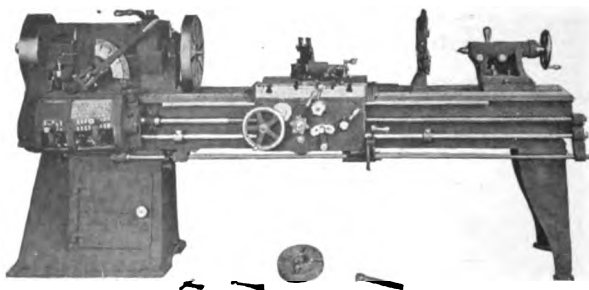
Geared Head, Single Pulley Drive.

Our 20", 24" and 30" Lathes are built in two styles:

Three Step Cone Friction Double Back Gear.

Geared Head, Single Pulley Drive.

All sizes of machines are built with Quick Change Mechanism.



16" Heavy Quick Change Geared Head Lathe

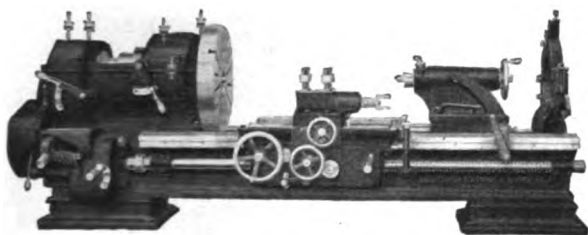
THE HOUSTON, STANWOOD & GAMBLE COMPANY

CINCINNATI, OHIO

Manufacturers of Heavy Duty Lathes

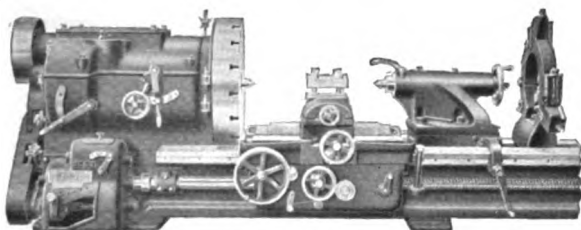
HIGH POWERED ENGINE LATHES

Extra Heavy Design in 32', 36', 42', 48', 54' and 60' Swings

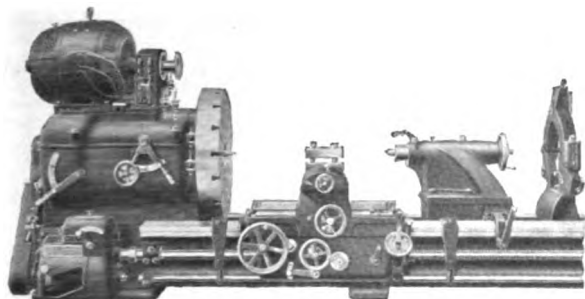


With
Cone Drive

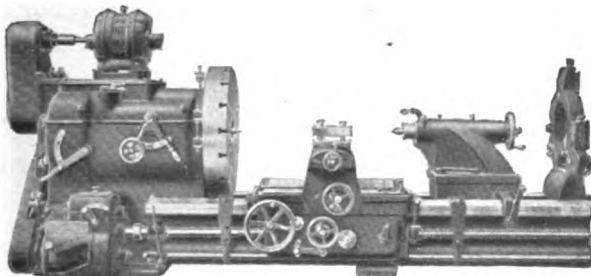
With
Single Pulley
Drive



With
D. C. Variable
Speed Motor



With
A. C. Constant
Speed Motor

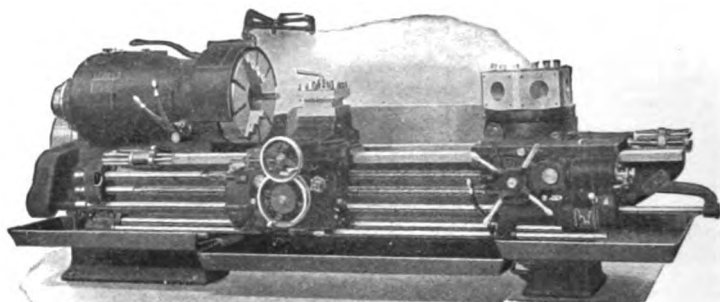


STEEL gears throughout. Internal gear in face plate is steel FORGING. TOOTHED positive clutches for carriage feeds. Accurately built, large capacity, production tools.

INTERNATIONAL MACHINE TOOL COMPANY

1124 W. 21st St., INDIANAPOLIS, IND.

Manufacturers of The "Libby" Turret Lathes



"LIBBY" TURRET LATHE

At present we are offering two sizes, our 16-18" type "A" machine with $3\frac{1}{4}$ " hole through the spindle and our 24-26" type "C" machine with either $4\frac{1}{2}$ " or $7\frac{1}{4}$ " hole through the spindle. The type "A" machine will swing 16" over the tool post carriage and 18" over the ways; the type "C" machine will swing 24" over the tool post carriage and 26" over the ways.

Design is Right—In designing, building and offering the "LIBBY" Lathe we have had in mind the following prime factors:

A line of heavy duty turret lathes capable of forming, facing, turning and boring chucked pieces up to 26" in diameter and bar work up to $7\frac{1}{4}$ " in diameter.

An all-gear head machine with a single pulley drive.

A machine with a side carriage, permitting the full swing of the work.

A machine with flat ways so located as to receive, as nearly as possible, all the cutting strains on the flat ways.

A machine with the best relative number of feeds and speeds for maximum quantity and quality production.

A machine with all feeds for each carriage independent one of the other.

A machine with convenient power rapid traverse for each carriage, independent one of the other and of the feeds.

A machine with abundant power for pulling heavy extensive cuts.

A machine with abundant rigidity and stiffness to easily carry heavy strains and produce accurate work continuously.

A machine so convenient to handle and easy on the operator that there would be every incentive to keep the machine under cut a maximum percentage of the time and thus give a maximum production.

We Claim for the "Libby" Lathe—That the limit of its production is the limit of the ability of the cutting tools to stand up.

That it is adapted to successful, rapid, continuous service under the most severe conditions.

That it is at its best in heavy work—several broad faced or other cutting tools working at one time.

That on account of its strength, rigidity and stiffness it will produce work free from chatter with smooth, accurate finish.

That the control of the machine is so concentrated and the convenience for operation so great that men like to operate a "LIBBY" Lathe and consequently push production with a minimum of fatigue.

INTERNATIONAL MACHINE TOOL COMPANY

CONDENSED DATA ON "LIBBY" LATHES

	16-18" "A" Lathe	24-26" "C" Lathe 4½" Hole	24-26" "C" Lathe 7½" Hole
Swing over ways.....	18½ in.	26½ in.	26½ in.
Swing over carriage.....	17¼ in.	24 in.	24 in.
Travel of turret carriage.....	44 in.	72 in.	72 in.
Travel of tool post carriage.....	40 in.	72 in.	72 in.
Greatest boring depth capacity.....	13 in.	23 in.	23 in.
Hole in spindle.....	3⅞ in.	4½ in.	7½ in.
Three-jaw Universal chuck.....	16 in.	22 in.	22 in.
Front bronze bearing.....	4½ in. x 7⅞ in.	6½ in. x 8⅞ in.	9½ in. x 8⅞ in.
Rear bronze bearings.....	4½ in. x 5½ in.	5½ in. x 5½ in.	8½ in. x 5½ in.
Drive pulley—diameter.....	18 in.	18 in.	18 in.
Countershaft speed.....	480	500	360
Width of belt.....	4 in.	8 in.	8 in.
Horse power of motor.....	10	20	20
Speed of motor (constant).....	1200	1200	1200
Speed of motor (variable).....	750 to 1600	750 to 1600	750 to 1600
Size of motor pulley at 1200	4½ in. x 7¼ in.	8½ in. x 7½ in.	8½ in. x 5½ in.
R. P. M.....	diam.	diam.	diam.
Width of front way.....	5½ in.	6 in.	6 in.
Width of back way.....	3½ in.	4½ in.	4½ in.
Turret slide bearing on ways.....	276 sq. in.	316 sq. in.	316 sq. in.
Tool post slide bearing on ways.....	141 sq. in.	144 sq. in.	144 sq. in.
Diameter turret base.....	12½ in.	16 in.	16 in.
Diameter of turret across flats.....	14 in.	18 in.	18 in.
Hole in turret bushed to.....	3¼ in.	4¼ in.	4¼ in.
Center of turret holes over ways.....	9 in.	12½ in.	12½ in.
Number of turret feeds.....	10	10	10
Range turret feeds.....	1/256 in. to ¼ in.	1/256 in. to ¼ in.	1/256 in. to ¼ in.
Diameter of tool post.....	7 in. sq.	9 in. sq.	9 in. sq.
Tool post feeds.....	6	6	6
Range of feeds.....	1/128 in. to ¼ in.	1/128 in. to ¼ in.	1/128 in. to ¼ in.
Power cross feeds.....	6	6	6
Range of cross feeds.....	1/128 in. to ¼ in.	1/128 in. to ¼ in.	1/128 in. to ¼ in.
Screw cutting change gears.....	7	7	7
Threads per inch.....	2 to 32	2 to 32	2 to 32
Number spindle speeds.....	8	8	8
Range spindle speeds.....	8 to 300	8 to 238	8 to 142
	1.87 to 1	2.1 to 1	2.53 to 1
	2.75 to 1	3.3 to 1	3.5 to 1
	5 to 1	5.6 to 1	6.7 to 1
	8 to 1	8.8 to 1	9.3 to 1
	13 to 1	14.9 to 1	12.2 to 1
	20 to 1	23.5 to 1	16.9 to 1
	38 to 1	40.1 to 1	32 to 1
	60 to 1	62.5 to 1	45 to 1
Gear ratios.....	60 in. x 138 in.	71 in. x 170 in.	71 in. x 170 in.
Floor space.....	33 in.	57 in.	57 in.
Radial sweep of bar.....	40 ft.	35 ft.	35 ft.
Rapid traverse per minute.....	7600	12000	13500
Net weight.....	8000	12600	14000
Shipping weight.....	9200	14000	15000
Shipping weight—export.....	250 cu. ft.	390 cu. ft.	390 cu. ft.
Space occupied—export.....			

JONES & LAMSON MACHINE CO.

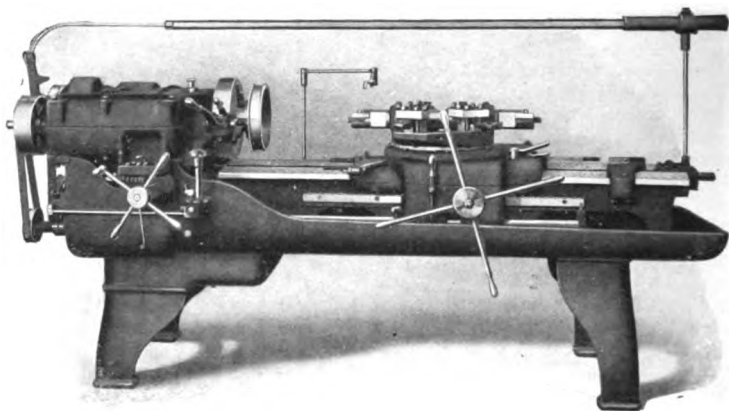
SPRINGFIELD, VERMONT, U. S. A.

109 QUEEN VICTORIA STREET, LONDON, E. C.

France, Spain and Belgium: F. Auberty & Co., 91 Rue de Maubeuge, Paris.
Holland: Spliethoff, Beeuwkes & Co., Rotterdam

Manufacturers of Flat and Turret Automatic Lathes

HARTNESS FLAT TURRET LATHES



324

The Hartness Flat Turret Lathe with cross-sliding head is made in two sizes, and may be furnished with an equipment of tools for either bar work or chuck work, or a double equipment for both bar and chuck work.

The smaller machine is called the 2 x 24-inch, and when equipped with the automatic die outfit of tools it turns nearly every conceivable shape from the bar, up to $2\frac{1}{4}$ inches diameter and 24 inches of length. On chuck work its capacity is $12\frac{1}{2}$ inches diameter or less.

The 3 x 36-inch size handles bars of stock up to 3 inches in diameter, turning pieces up to 36 inches in length. It may also be equipped for chuck work up to $14\frac{1}{2}$ inches in diameter.

SPECIAL FEATURES

The Original Flat Turret

The Flat Turret was put on the market in 1891. Over ten thousand (10,000) machines equipped with them have been built and sold since, to the great satisfaction of the users. A large, steady tool clamping surface, a circular gib holding the turret down clear around its periphery, a locking pin directly under the cutting point of the tool—all these features combined to set a new standard of output, accuracy and range of work in turret lathe practice.

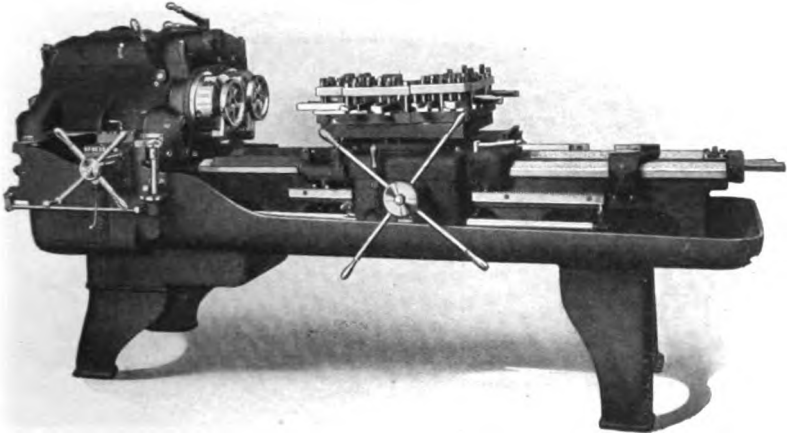
The unique set of tools employed covered at one leap the evolution from the old-fashioned "screw machine" to the modern turret lathe. It enabled the turret lathe to practically displace the engine lathe on bar and stud work.

The Cross-Sliding Head

This feature, introduced in 1903, still further extended the field of the turret lathe, making it the standard machine for most chuck work of moderate size. The Cross-Sliding Head has three advantages: (1) It offers a cross-sliding motion gibbed directly and securely to the bed. There is no piling of slide on slide, no narrow bearing foundation for a lofty superstructure of slide, tool holder and tool. (2) It permits the cross feed to be applied to every tool on the turret if necessary. (3) By allowing a cross adjustment to every tool, complicated and costly special tools are minimized. The regular outfit covers all regular work. The design is so stable that the piloted type of holder is seldom needed.

JONES & LAMSON MACHINE CO.

THE DOUBLE SPINDLE HARTNESS FLAT TURRET LATHE



The special field of usefulness of the "Double-Spindle" Hartness Flat Turret Lathe is in machining moderate sized castings, forgings, and certain limited classes of bar work in large lots for quantity of production. In addition it may be used as a single-spindle machine of larger capacity, in which case it is adapted to small lot manufacture.

The machine has all the good qualities of the Single-Spindle Flat Turret Lathe which we introduced nearly a quarter century ago. With the expiration of the original patents, the flat turret has been adopted by other makers as the standard design for manufacturing work. But our later developments, like the cross-sliding head and the essential features of the double spindle, are of great mechanical and economic value to the manufacturer and are found exclusively in these machines.

The double-spindle feature nearly doubles the output per operator and per machine.

Two spindles, two sets of tools, two pieces of work.

One turret, one machine, one operator, one set of motions.

SPECIFICATIONS

Working Range. Swing over ways is 17 inches when used as a single-spindle machine, 10½ inches when both spindles are used. Cross travel of head is 10½ inches. Hole through spindle is 3¼ inches.

The Cross-Sliding Head. This is the only turret lathe in which the work-carrying headstock has a cross travel. This is indispensable on chuck work and is frequently convenient on bar work. It gives a cross feed for every tool without resorting to the frail double slide under the turret. Nine speeds in both directions from 20 to 298 revolutions per minute instantly obtainable. All gears run in oil bath.

The Turret. This is the original flat turret, 22 inches square, and is gibbed near outer edge. Index pin is located directly under working tool. On single-spindle work the corners of the turret can be used, giving eight positions in all.

The Power Feed. Both the carriage and the cross-sliding headstock are provided with power feed. It operates in both directions; has nine changes from 20 to 120 revolutions per inch of travel. These changes are instantly obtainable by sliding gears.

Stops. Each of the eight positions of turret is equipped with a separate stop, and there are four extra stops, making twelve in all. If desired, six stops can be used for one tool. The cross travel of the head is controlled by nine stops. Both sets of stops act in both directions and are placed as near as possible to the direct line of stress.

Floor Space for Machine is 5 x 10 feet. Approximate weight: net, 6000 pounds; crated, 6700 pounds; boxed for export, 7200 pounds. Cubic measurement, 240 cubic feet.

(Continued on next pages)



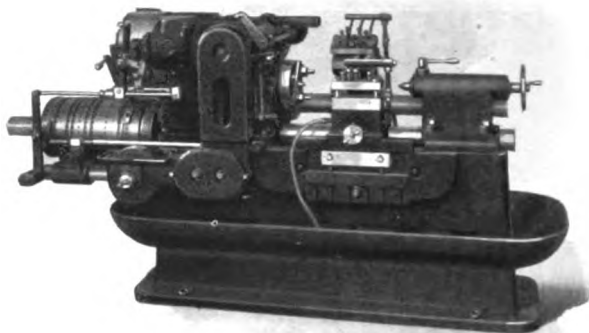
(Continued from preceding pages)

JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

THE FAY AUTOMATIC LATHE

The Fay Automatic Lathe is a real lathe, with nine speed, all steel geared headstock, with three automatic speed changes, tailstock, carriage and bed. It differs from the engine lathe in the details of its mechanism, which fit it especially for the particular work it is designed to do. There is also the added mechanism required to make it automatic in all its motions.



Field: The Fay Lathe is designed for the automatic turning of work held on centers. It is thus adapted to work which is itself centered, or to work which is mounted on an arbor.

In the class of *centered work* are included such standard parts as steering knuckles for automobiles, driving gears for transmission, forgings in general of such shape as to be turned rather than chucked, and many miscellaneous castings of the same type.

In the class of *work done on arbors* is included the large variety of parts which in ordinary practice is turned in the engine lathe by this means, as pulleys (either straight-faced or crowned), gear blanks, flanges, disks, hubs, and a thousand and one other pieces of the kind used in textile machinery, automobiles, machine tools, electrical work and machine building in general.

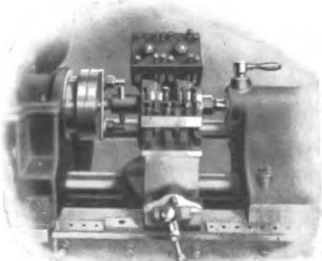
Second operation work is the legitimate field of the Fay Lathe.

Furthermore, it has a large field of usefulness in the accurate finishing of parts roughed out on other and less accurate automatic machines.

On the work described above the Fay Lathe will do straight turning, taper turning, form turning, straight facing, bevel facing, recessing, singly or in combination, with roughing or finishing cuts. It will do everything of this sort except threading, for which it is not adapted.

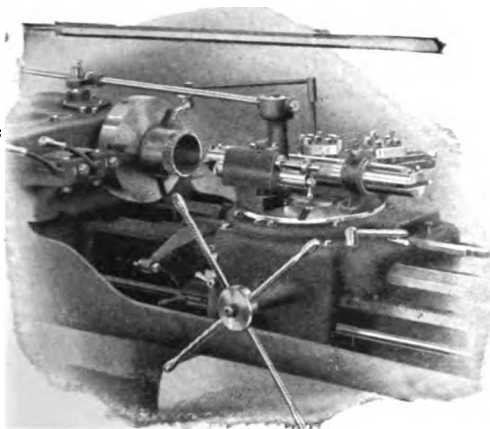
Advantages of the Fay Automatic

1. Ease of setting.
2. Rapidity of changing work.
3. Two pieces at a time.
4. Multiple tooling.
5. Taper turning and bevel facing.
6. Form turning.
7. Turned surfaces free from scoring on the return movement.
8. Flexibility of mechanism.
9. Facing and turning simultaneously.
10. One operator runs two machines.



Profitable Work for the Automatic Lathe

JONES & LAMSON MACHINE CO.



AUTOMATIC CHASING ATTACHMENT

The Hartness Chasing Attachment is shown applied to the Flat Turret Lathe.

This attachment is automatic. The carriage is locked to the bed and the attachment clutched with its positive drive from the work spindle. The threading tool feeds forward at cutting depth under lead screw control until the tool bar strikes a stop. The tool is then withdrawn to clear the work and re-

turned at high speed to the starting point, where it is again fed in to cutting depth and engaged with the lead screw. The work spindle revolves continuously. The only motion required of the operator is that of adjusting the cross sliding head forward a slight amount during the return of the cutter to feed the tool in for the new cut. There is no possibility of overrunning and gouging into a shoulder, no matter how fast the machine is run.

The advantage of this attachment is that it gives engine lathe accuracy to turret lathe threading—and it gives much more than engine lathe speed.

HARTNESS AUTOMATIC DIE

Wide Range Few Dies High Accuracy Small Expense

No. 1 Die: Range for standard threads, from $\frac{1}{8}$ inch to $\frac{1}{4}$ inch diameter, any length. Particularly adapted for small hand or automatic screw machine work.

No. 4 Die: Range, $\frac{1}{4}$ inch to $1\frac{1}{4}$ inches diameter. This die is suitable for general turret lathe and screw machine use. It is especially adapted for use in automatic screw machines, owing to the compactness of its design.

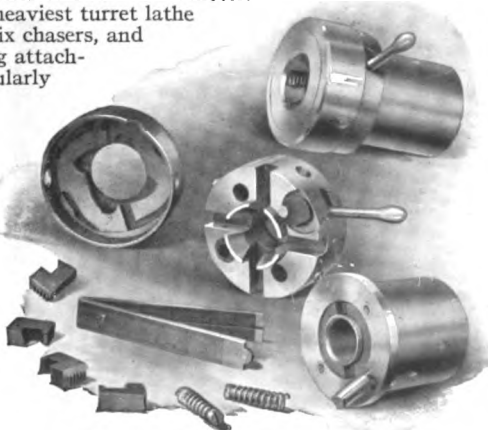
No. 6 Die: Range, $\frac{3}{4}$ inch to 2 inches diameter. This die is adapted for medium to large work on screw machines and turret lathes, and for the larger sizes of automatic screw machines.

No. 9 Die: Range, $1\frac{1}{4}$ inches to 3 inches diameter.

This die is designed for the heaviest turret lathe work. It is provided with six chasers, and has a special double roughing attachment which adapts it particularly to large diameters or coarse pitches.

Any of these dies, even the large No. 9, will thread pitches as fine as 32 per inch on its largest diameter without danger of stripping.

The lead-controlling feature is exclusive with this die. You can cut long threads as accurate in pitch as you will get from the ordinary engine lathe.



The No. 4 Hartness Automatic Die and Its Parts

THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO

NEW YORK

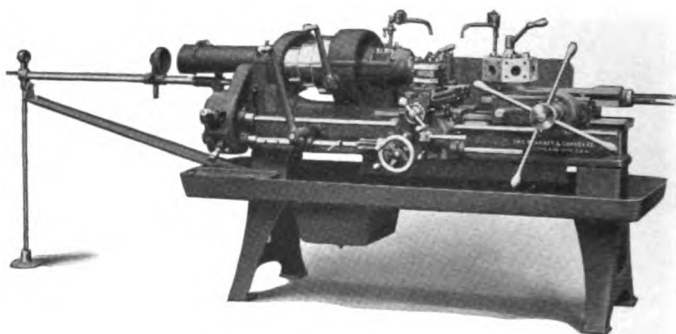
BOSTON

BUFFALO

DETROIT

CHICAGO

Manufacturers of Turret Machinery

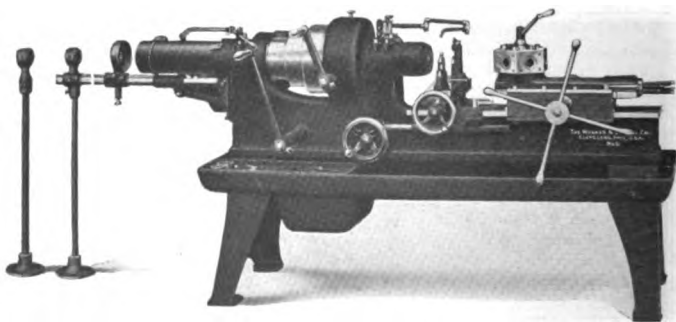


No. 4 Universal Turret Screw Machine: Bar Equipment
Capacity: $1\frac{1}{2}$ " x 10"; 16" swing

328

TURRET SCREW MACHINES

Included in the five sizes is the No. 4 Universal, shown above, which takes two cuts at one time. Individual power-operated feed shafts for carriage and turret saddle provide for simultaneous operation at the exact feed suited to each diameter, as with the Universal Hollow-Hexagon Turret Lathes.



No. 6 Turret Screw Machine: Geared Friction Head
Capacity: $2\frac{1}{4}$ " x 12"; $20\frac{3}{4}$ " swing
Other Turret Screw Machines from $\frac{5}{8}$ " capacity



THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO

NEW YORK

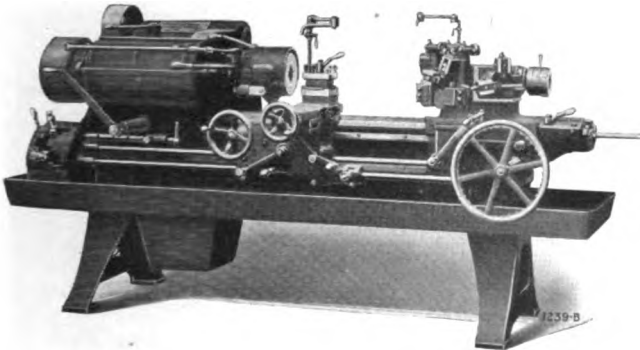
BOSTON

BUFFALO

DETROIT

CHICAGO

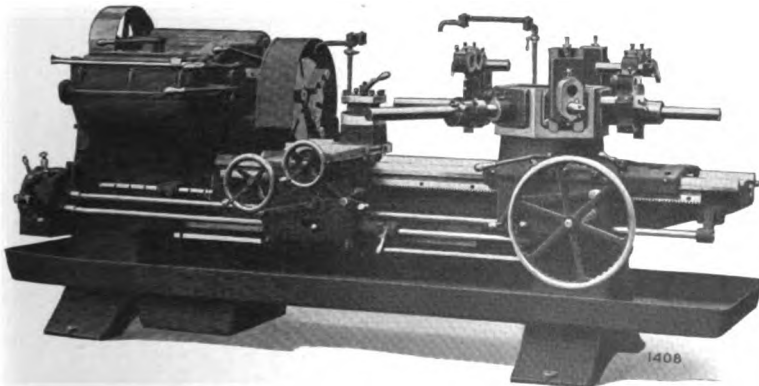
Manufacturers of Turret Machinery



No. 2-A Universal Hollow-Hexagon Turret Lathe: Bar Equipment
Two Capacities— $2\frac{1}{2}$ " x 29"; $16\frac{1}{2}$ " swing
 $3\frac{1}{4}$ " x 29"; $16\frac{1}{2}$ " swing

UNIVERSAL HOLLOW-HEXAGON TURRET LATHES

These machines take two cuts at one time. By means of separate feed shafts for carriage and turret saddle, each with ten individual feeds in either direction, the carriage will face, neck or form while the turret is drilling, reaming or turning. Each machine is equally adaptable to bar or chucking work.

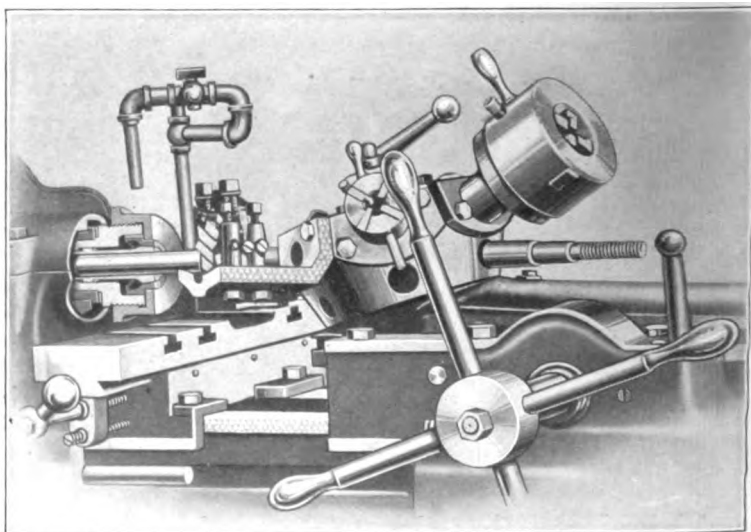


No. 3-A Universal Hollow-Hexagon Turret Lathe: Chucking Equipment
Two Capacities— $3\frac{1}{2}$ " x 44"; $21\frac{1}{2}$ " swing
 $4\frac{1}{2}$ " x 44"; $21\frac{1}{2}$ " swing

WOOD TURRET MACHINE CO.

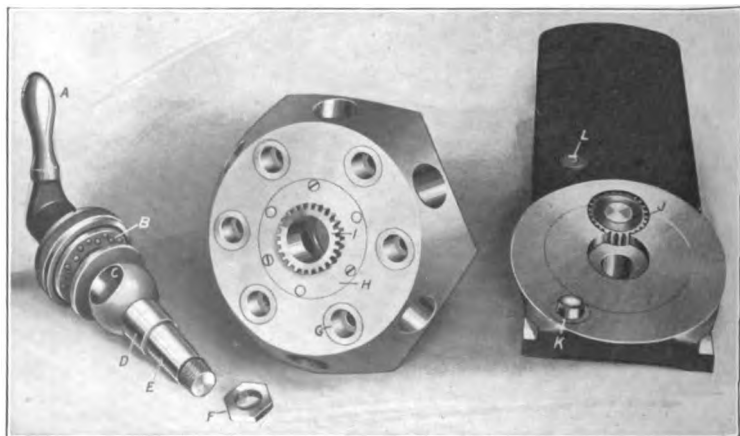
BRAZIL, INDIANA, U. S. A.

Manufacturers of the Tilted Turret Lathes and Screw Machines

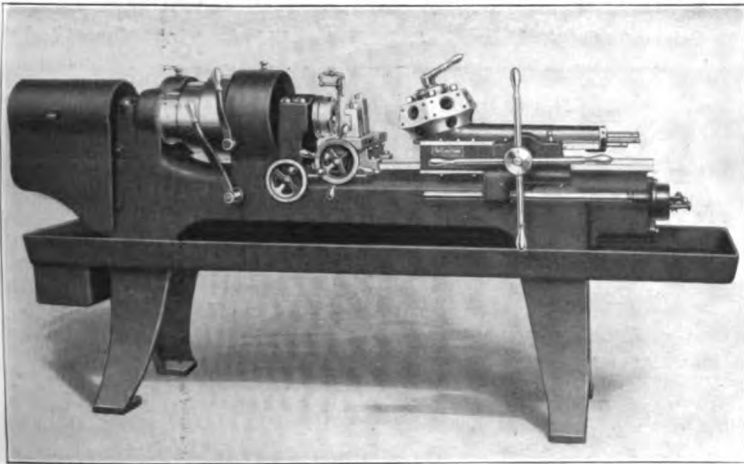


330

By mechanical skill, can turret lathes and screw machines be made a precision machine, as well as a productive machine? Send for **THE TILTED TURRET Lathe and Screw Machine encyclopedia**, and decide for yourself.



WOOD TURRET MACHINE CO.



THE TILTED TURRET, lathes and screw machines are a strictly high grade machine tool. Manufactured under a highly efficient mechanical organization, with jigs and gages. It is easy to operate, rigid in construction and will hold its accuracy indefinitely. Wearing parts so constructed that they can be adjusted without changing the alignment, and will hold its accuracy with years of service.

We specialize exclusively in manufacturing **THE TILTED TURRET** lathes, screw machines and tools. We build a line of machines for manufacturing from a pin to a locomotive. Since the introduction of **THE TILTED TURRET**, it has had a steady increase in sales of duplicate orders. **FIFTEEN YEARS OF SATISFIED USERS. ASK THE USER.**

331

THE TILTED TURRET, SEMI-AUTOMATIC, FRICTION-GEARED HEAD

Number of Machine.....	No. 2 1"	No. 3 1½"	No. 4 1½"	No. 5 1½"	No. 6 2"
Automatic chuck capacity.....	Prune Quince	Plum Peach	Robin Sparrow	Thrush Eagle	Dove Lark
Without power feed to turret slide.....	1½"	1½"	1½"	2½"	2½"
With power feed to turret slide.....	1½"	1½"	1½"	2½"	2½"
Diameter hole in spindle (automatic chuck removed).....	1½"	1½"	1½"	2½"	2½"
Diameter hole in automatic chuck plunger.....	1½"	1½"	1½"	2½"	2½"
Diameter thread on spindle.....	3½"	3½"	3½"	5½"	5½"
Pitch of thread on spindle.....	8 P	8 P	8 P	6 P	6 P
Swing over bed.....	13"	13"	13½"	15"	15"
Largest diameter cone.....	12"	12"	12"	14"	14"
Width of belt.....	3"	3"	3"	3½"	3½"
Diameter of turret (across the flat).....	6½"	7½"	7½"	10½"	10½"
Diameter of holes in turret.....	1½"	1½"	1½"	1½"	2"
Holes in turret to top of slide.....	3½"	3½"	4"	4½"	4½"
Effective motion to slide.....	10"	10"	10"	12"	12"
Greatest distance end of spindle to face of turret.....	16"	16"	16"	30"	30"
Friction pulleys on countershaft.....	10"x3¾"	10"x4¼"	12"x4¼"	14"x4¾"	14"x4¾"
Countershaft speed.....	325	300	250	225	200
Floor space.....	36"x96"	36"x102"	40"x108"	44"x128"	44"x132"
Weight, crated, for domestic shipment, about.....	2170	2440	2540	3830	4030
Weight, boxed, for foreign shipment, about.....	2545	2815	2915	4495	4725
Bulk, boxed, for foreign shipment, about.....	102 cu. ft.	102 cu. ft.	102 cu. ft.	190 cu. ft.	190 cu. ft.

With Automatic Chuck but without Bar Feed

Without power feed to turret slide.....	Raisin Elm	Willow Oak	Swallow Owl	Oriole Quail	Gull Raven
With power feed to turret slide.....					

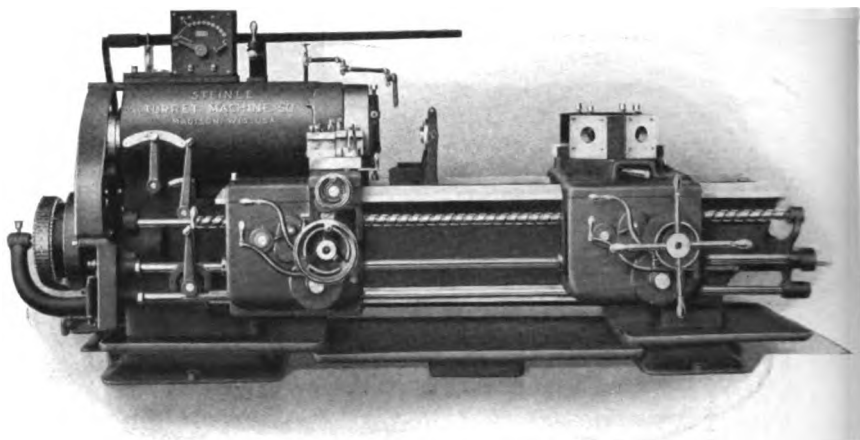
Without Automatic Chuck and Bar Feed

Without power feed to turret slide.....	Poplar Pine	Maple Walnut	Crow Hawk	Canary Wren	Maggie Buzzard
With power feed to turret slide.....					

STEINLE TURRET MACHINE CO.

MADISON, WISCONSIN

Originators of the Heavy Duty Full Swing Side Carriage Turret Lathe



Standard Steinle 24" Full Swing Side Carriage Turret Lathe with $6\frac{1}{4}$ " Hole through Spindle as Arranged with Motor Drive

332

Machine shown above is the superior of any heavy duty turret lathe on the market as a general purpose machine. It is, furthermore, without a peer in the production of any of the following work:

Turning out 6" shells from bar stock.

Boring 155 mm. shells from forgings.

Machining base plugs or adaptors for shells up to 16" size.

Boring, domeing, and recessing Liberty motor cylinders or French or English aviation motor cylinders.

Boring, facing, and reaming hubs for 56" and 60" field artillery limber or caisson wheels.

Boring, turning, and cutting off piston rings of either eccentric or concentric design.

Machining gear blanks for various manufactured products including machine tools.

Deep boring operations of all kinds including boring of oil holes through gun boring bars of any length.

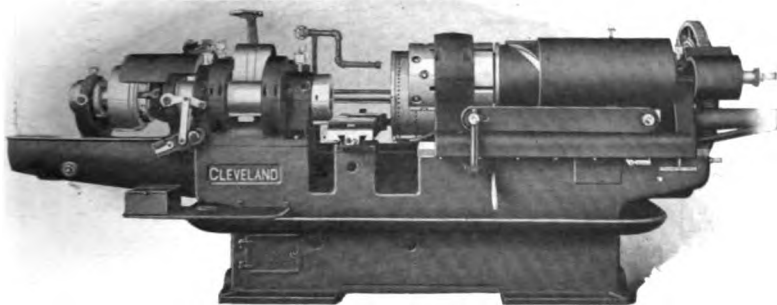
Machine can be furnished with 4", $6\frac{1}{4}$ " or 7" spindle bore, either belt driven or arranged for constant speed motor drive with thirty mechanical speed changes or variable speed motor drive.

Write for full information including list of users.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

Manufacturer of the "Cleveland" Automatic Chucking Screw and Forming Machines



The "Cleveland" is made in five different designs and thirty-five different sizes, and we can produce parts from $\frac{3}{8}$ " to $7\frac{3}{4}$ " capacities and 18" long. Our spindle speeds for various kinds of work range from twenty to thirty-five hundred revolutions.

333

Our machines are intended to handle from the simplest job to the most accurate and we have various designs of machines to choose from. If your work is in quantities not requiring many operations, we have the correct machine at a low price. If your work is accurate with a great number of operations, our full turret model A automatic is the style we always recommend.

We have manufactured over 25000 Cleveland automatics which are installed all over the civilized world, some of them have been in use from fifteen to twenty years and are still giving good satisfaction.

A great advantage of the "Cleveland" is its real simplicity for second operation work or producing pieces from forgings or castings.

We have a tilting magazine that is easy to set up and a great labor saver for the reason that the piece is removed from the magazine, deposited in the chuck, operations performed and ejected when finished.

One man can operate a number of our regular machines on bar work and also with the above attachment.

We can slot, slab, knurl, thread, recess, roll your name on if desired, turn taper, produce as many as six shoulders on the piece if necessary and many other operations. Clevelands are also used quite extensively in piston turning up to 4" in diameter and 5" long without adding many special features. We can handle a bar from one ounce to sixteen hundred pounds and produce parts from cast iron, brass, steel, rubber, aluminum, etc., etc.

We have been manufacturing and selling automatics for twenty-four years.

It is rarely we receive a blue print or sample we are not able to figure on because of our great capacities.

We were the pioneers in the building of large automatics for the market. There is no other make of automatic in existence as large as we make them.

THE NATIONAL ACME COMPANY

CLEVELAND, OHIO, U. S. A.

NEW YORK

BOSTON

CHICAGO

DETROIT

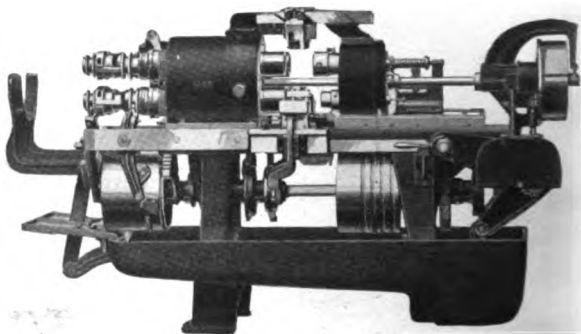
Screw Machinery, Screw Machine Products, Dies and Taps

ACME MULTIPLE SPINDLE AUTOMATIC SCREW MACHINES

Automatic producers of duplicate parts from Brass, Iron and Steel bars, in sizes up to $3\frac{3}{4}$ " diameter, 12" long.

Secondary operations are reduced to a minimum by the use of tools for shaving, cross drilling, end and side milling, etc.

Furnished with Single Belt or Motor Drive.



AUXILIARY SCREW MAKING MACHINES

Of fully automatic and semi-automatic types are built as follows:

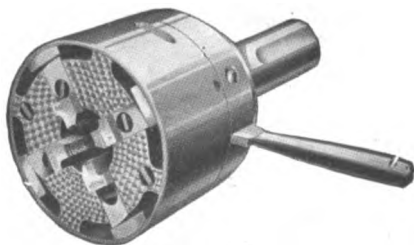
Stud Threaders, Bolt Threaders, Single and Multiple Spindle Drilling Machines, Screw Head Slotting Machines (highly specialized for Secondary Operations); also Tool and Chaser Grinders.

NAMCO AUTOMATIC COLLAPSING TAPS



Have positive collapsing chasers fully supported back of the cutting edge; simplicity of construction and few adjustments; wide range of work as chaser diameter is largest diameter on tap. "No hole too deep."

NAMCO AUTOMATIC THREADING DIES



For every threading requirement include Self Opening Dies for Hand Machines; Self Opening and Self Closing Die Heads for Automatic Screw Machines, Bolt Threaders, etc.; Adjustable Chaser Dies for heavy duty work; Adjustable Spring Dies.

Catalogs on any of the above sent on request.
Quotations made on samples or blue prints.

THE NATIONAL ACME COMPANY

(Successors to Windsor Machine Co.)

WINDSOR, VERMONT

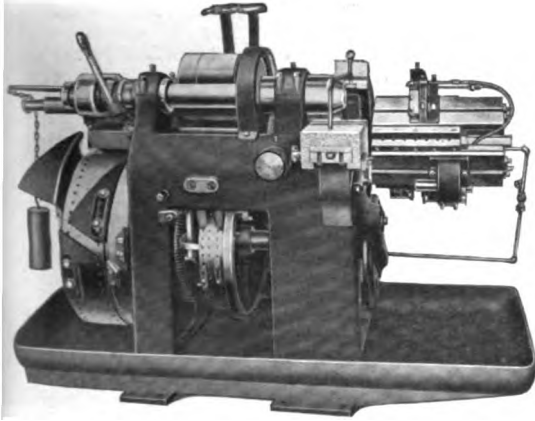
NEW YORK

BOSTON

CHICAGO

DETROIT

GRIDLEY MULTIPLE AND SINGLE SPINDLE AUTOMATIC SCREW MACHINES



The Gridley Single Spindle Automatic

is built in four sizes—
 $2\frac{1}{4}$ "— $3\frac{1}{4}$ "— $4\frac{1}{4}$ "—5",
and handles work up to
12" in length.

Gridley Single and Multiple Spindle Screw Machines are fully automatic and are designed for making duplicate parts from bar stock, steel or brass.

Extreme accuracy is obtained by the rigid frame design and method of holding tools close up to their cutting points.

The simplicity of set-ups permits an exceptionally wide range of tooling, while the possible tool combinations reduce secondary operations to a minimum.

The Gridley Single completes, *automatically*, work usually accomplished on turret lathes, in sizes up to 5" diameter, while the Multiple Spindle finishes the smaller duplicate parts up to $2\frac{5}{8}$ " diameter.

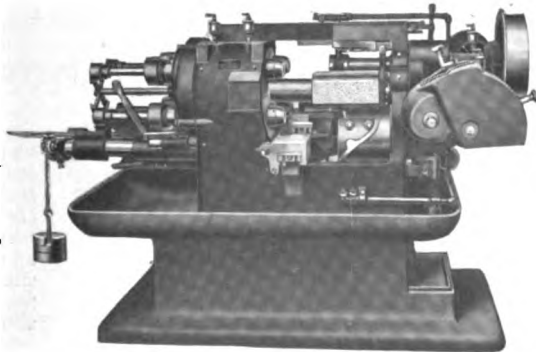
Both types are furnished with either Belt or Motor Drive.

Complete descriptions on request.

Catalogs or bulletins.

The Gridley Multiple Spindle Automatic

is built in four sizes—
 $\frac{3}{4}$ "— $1\frac{1}{4}$ "— $1\frac{3}{4}$ "— $2\frac{1}{4}$ ",
and handles work up to
7" in length.

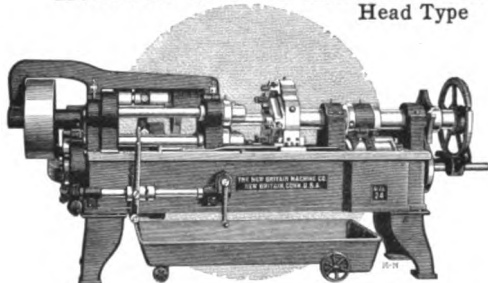


THE NEW BRITAIN MACHINE CO.

NEW BRITAIN, CONN.

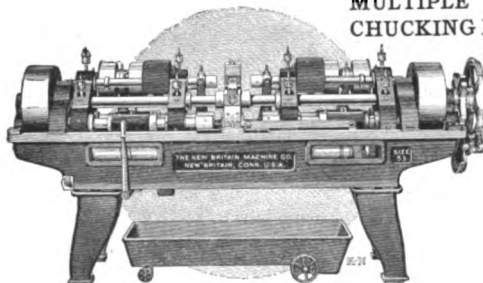
Manufacturers of Automatic Screw and Chucking Machines

MULTIPLE SPINDLE AUTOMATIC CHUCKING MACHINE—Single-Head Type



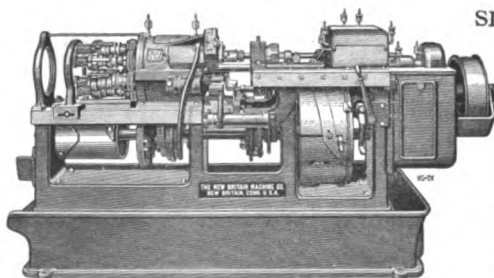
Designed for finishing castings, forgings, and second operations on screw-machine products. All operations performed simultaneously and automatically, the time necessary to complete a piece being measured by the period required for the longest single operation or subdivision thereof. Production three to five times that of the turret lathe or hand screw machine.

MULTIPLE SPINDLE AUTOMATIC CHUCKING MACHINE—Double-Head Type



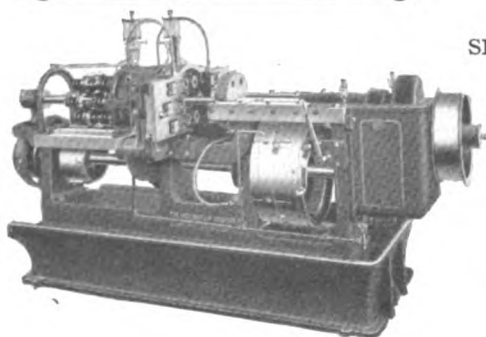
Similar to machine above, except that it is equipped with two sets of tool-carrying spindles, adapting it for the simultaneous machining of opposite ends of the work. Productions three to ten times those obtained by other methods.

SIX-SPINDLE AUTOMATIC SCREW MACHINE



For producing parts from bar stock. Fully automatic. Its six spindles make rehandling of complicated work unnecessary and greatly increase production on simple work by the subdivision of the longer operations. Sizes, $\frac{3}{8}$ ", 1", $1\frac{1}{8}$ " and $2\frac{1}{2}$ ".

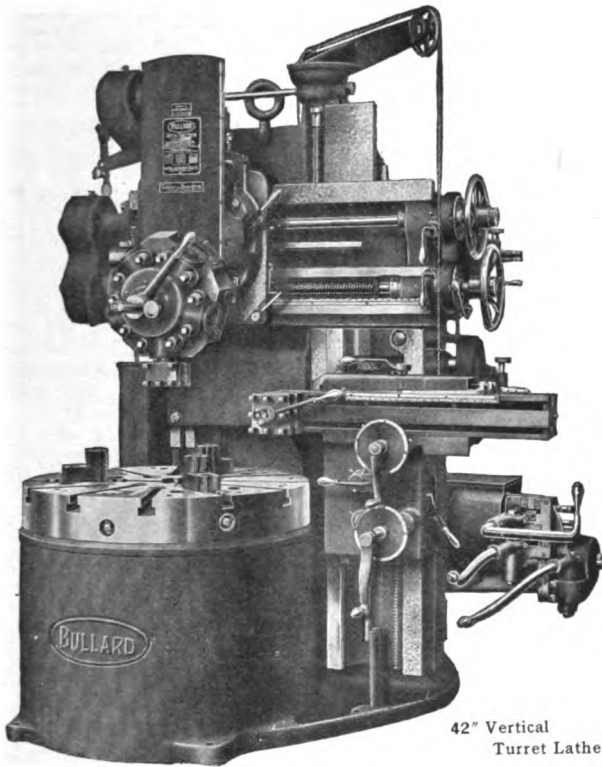
SEXTUPLE AUTOMATIC BAR MACHINE



For blanking rolls, sleeves, pipe couplings, studs, nuts, etc., from bar stock. Six spindles. Fully automatic. Designed to feed, drill, face, turn, chamfer, and cut off in all six positions, making possible productions nearly six-fold those of a single spindle automatic.

THE BULLARD MACHINE TOOL CO.

BRIDGEPORT, CONN., U. S. A.



42" Vertical
Turret Lathe

337

Adding to Productiveness.

The **BULLARD VERTICAL TURRET LATHE** is built on the principles of efficiency—each step in its development has been subjected to a searching analysis with reference to the elimination of wasted time.

Operating handles and actuating levers are so arranged that every machine movement may be accomplished from one position. Feeds and speeds are readily changed, and cutting tools set to required position from the operating station.

The rigid construction of the **VERTICAL TURRET LATHE**, its alloy steel gearing and its excess driving power reduce the cutting time to a minimum, making the *tool* the limiting factor.

Lubrication, automatic and continuous, precludes the possibility of overheated bearings, and by relieving the operator of the necessity for constant attention to this detail adds to his *producing time* that time usually wasted in "oiling up."

Send for our book "Cutting Time Between Cuts" for the full story. Your name, with the name of your company and the position you hold, will bring it by return mail. This book will interest you—the facts and figures in it were compiled for that purpose.

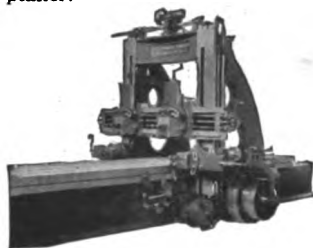
THE CINCINNATI PLANER CO.

OAKLEY, CINCINNATI, OHIO
Manufacturers of Planers and Boring Mills

CINCINNATI PLANERS

In these days of advanced methods for greater production the three principal elements entered into are Variable Cutting Speeds, the rapid and easy manipulation of all parts, and rigidity in design to withstand the strains imposed by high cutting speeds.

Cincinnati Planers are designed for speed variation, power, rigidity, durability, convenience in operation and adaptability for all classes of work required of a planer.



Standard Planer

being made from semi-steel castings and the pinions from steel forgings.

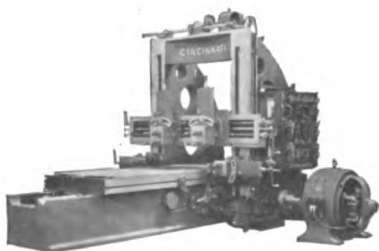
Standard and Heavy Pattern Planers are made in all sizes from 22" to 96". The beds are of a heavy deep box section and are especially strengthened where the gearing and uprights are mounted. The tables are of unusual thickness and are braced at short intervals with heavy ribs, thus preventing any possibility of springing under any circumstances. Cross rails are of great depth, and have an extra deep box brace on the back. The heads are distinctive, the ends of tool blocks and slides being made round. The gearing and rack are of extra wide face—all the large gears and racks



Widened Planer

Widened Planers: There is a great variety of planing on woodworking machinery, electrical machinery, printing presses, agricultural implements, etc., which does not require a standard machine, and these manufacturers are rapidly recognizing the advantage of the Widened Planer. In a great many cases a 36" planer widened to 48" will do the job, and do it quicker than the 48" Standard machine, and it is easier to handle and capable of higher speeds. We build these planers to suit your work, and have patterns for the various sizes given below.

SIZES: 36" x 28", 36" x 30", 42" x 36", 48" x 36", 56" x 42", 60" x 48", 72" x 56", 84" x 72", 96" x 72", 120" x 96".



Reversible Motor Driven Planer

furnished. The Reversible and Non-reversible motor drives for direct current and the Speed Box for alternating current.

Variable Speeds: The greatest possible gain in planing comes from access to a change of cutting speeds. A correct speed for all materials and conditions, instantly available, is the secret economy in planing.

All Cincinnati Planers from 22 to 48 inches inclusive are regularly furnished with our patent Tu-Speed Drive giving two cutting speeds and a constant return. Where a greater number of speeds are needed our Reversible motor drive, Non-reversible motor drive or Speed Box drives are

Motor Drive: All Cincinnati Planers may be arranged for motor drive.

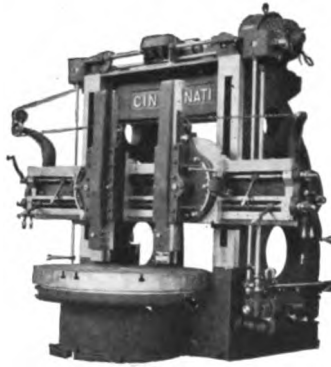
THE CINCINNATI PLANER CO.

CINCINNATI BORING MILLS

Bevel Gear Type: Made in 5 ft., 6 ft. and 7 ft. Massive Type.

GENERAL DESCRIPTION:

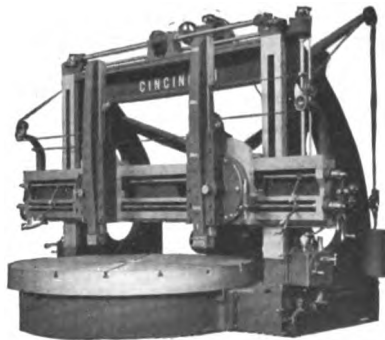
Capacity. These rapid production Mills have a capacity of two inches over the rated size. *The table* is large in diameter and rigidly constructed. *The bed* is deep and heavily ribbed; it has a box form of construction with which the Speed Box is cast integral. *The housings* are of box sections, with wide faces, and designed for the greatest possible rigidity. *The cross-rail* is of heavy box form, having a deep arch at the back, which resists the strains of the heaviest cuts. *The heads* have the long, narrow guide bearing at bottom of rail. **Rapid Power Traverse.** Both Heads have Rapid Power Traverse in all directions. **Feeds.** Eight feeds are provided on the 5' Mill ranging from $\frac{1}{24}$ to $\frac{3}{4}$. Ten feeds are provided on the 6' and 7' Mills ranging from $\frac{1}{28}$ to $\frac{7}{8}$.



Rapid Production Boring Mill

Spur Gear Type: These Boring Mills are made in the following sizes: Massive Type, 8 ft., 10 ft. and 12 ft., 10-16 ft. Extension.

GENERAL DESCRIPTION: *The bed* is of deep box form throughout. All parts are thoroughly ribbed and braced and the entire mechanism of the mill is supported on the bed. *The table* is large in diameter and supported on a broad, flat annular bearing of large diameter. *The main driving gear* is an internal spur gear cut from the solid. *The housings* are of massive box form, a wide and long base insuring rigidity under the most severe duty. *The cross-rail* is of box form and has a deep arch on the back so that any deflection due to weight of heads or pressure of the cut is reduced to a minimum. *The heads* have the narrow guide bearing at bottom of rail, which prevents all tilting or binding while heads are under cutting strain. *Eight different feeds* are provided ranging from $\frac{1}{32}$ to 1". Both heads have rapid power traverse.



Standard Boring Mill

339

Our facilities for building a very high grade product are unexcelled. Our system of inspecting each piece before allowing it to proceed to the next department assures the accuracy of every detail. We have a very complete equipment of jigs and fixtures which further assure all parts being made interchangeable as far as possible.

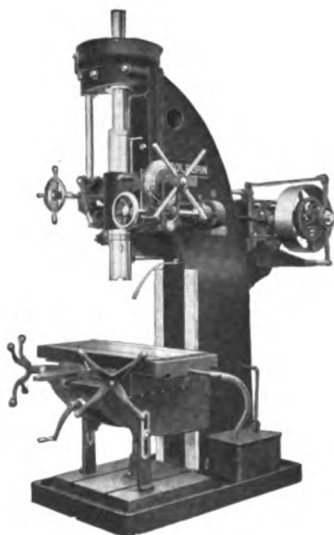
A test card of the final inspection of every machine after completion is recorded and filed in our office. Each machine is required to show within the limit of error and is tested under actual operating conditions before shipment.

COLBURN MACHINE TOOL CO.

FRANKLIN, PA., U. S. A.

Heavy Duty Drills—Vertical Boring Mills

COLBURN HEAVY DUTY DRILL PRESSES



Designed especially to meet the exacting demands of Heavy Duty Drilling and Tapping.

The size illustrated has a capacity to the full cutting edge of a 5 inch high speed drill in solid steel. Gears are heat treated and hardened, and run in a bath of oil. Shaft journals in speed box equipped with combined radial and thrust ball bearings. All levers are located at front of machine within easy reach of operator. Furnished with *plain* or *compound* table.

Built in three sizes:

D4—24" swing— $3\frac{1}{2}$ " drill capacity.

D6—36" swing— $3\frac{1}{2}$ " drill capacity.

D8—36" swing—5" drill capacity.

Send for bulletin showing the size you are interested in.

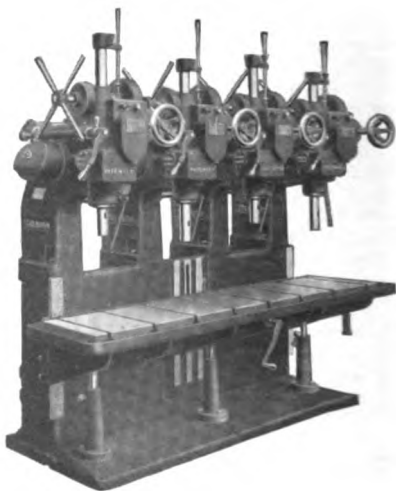
COLBURN NO. 2 MANUFACTURING DRILL PRESS

This manufacturing type drill, while originally designed as a single purpose machine for drilling large quantities of duplicate parts, has an ingenious patented feed and speed change device which gives it practically an unlimited range, thus greatly enlarging its field of usefulness.

Built with one, two, three, or four spindles to suit the buyer's requirements.

If you have duplicate pieces to drill, ream, tap, counterbore, etc., you will find this machine will greatly increase production and reduce costs.

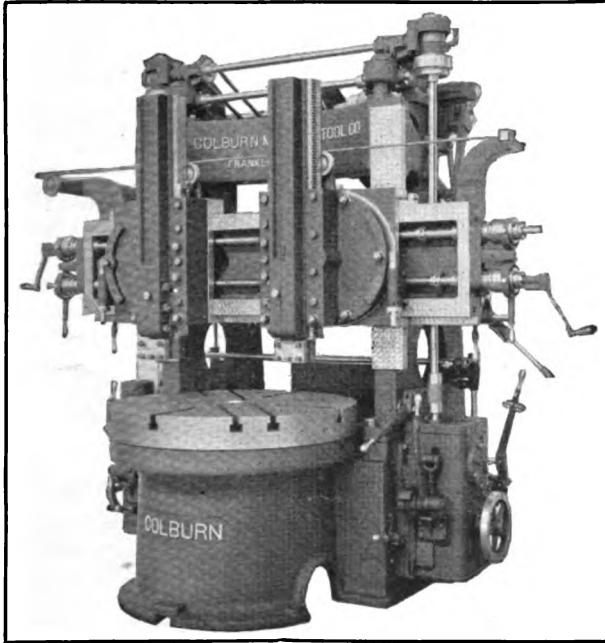
Bulletins illustrate and describe the various sizes we build.



COLBURN MACHINE TOOL CO.

FRANKLIN, PA., U. S. A.

Vertical Boring Mills—Heavy Duty Drills



341

COLBURN VERTICAL BORING AND TURNING MILLS

have long been known to be the *most efficient* Tools of their type on the market. They are of massive design and rigid construction throughout, and especially adapted for machining the most accurate as well as the heavier, rougher class of work. Rapid production of duplicate parts is one of the advantages of a machine tool, and very careful consideration was given this point in designing the Colburn Mill.

Power—Simplicity—Accuracy—Speed

are four essentials to consider in buying a Boring Mill. The Colburn embodies all of these features.

COLBURN BORING AND TURNING MILLS are built in four sizes: 48"—54"—60"—72" swing.

Let us send you a bulletin of the size you are interested in.

GIDDINGS & LEWIS MFG. CO.

FOND DU LAC, WIS., U. S. A.

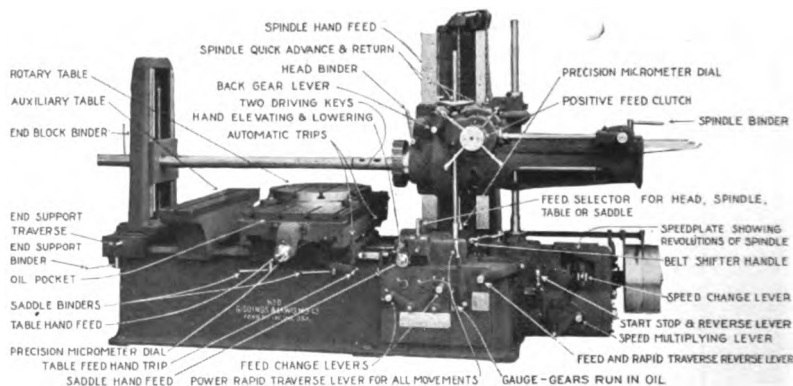
Machine Tool Builders

Domestic Agents: Taylor Machinery Co., Boston; Fairbanks Co., New York, Albany, New Orleans, Hartford; Kemp Machinery Co., Baltimore; H. A. Smith Machinery Co., Syracuse; Homer Strong, Rochester; Swind Machinery Co., Philadelphia; Sherritt & Stoer Co. (Virginia Territory), Philadelphia; Somers, Pitler & Todd Co., Pittsburgh; E. A. Kinsey Co., Cincinnati; Indianapolis; Stocker, Rumely, Wachs Co., Chicago, Milwaukee; English Tool & Supply Co., Kansas City; Sunderland Machinery & Supply Co., Omaha; Hendrie & Bolthoff Mfg. & Supply Co., Denver; Salt Lake Hardware Co., Salt Lake City; Eccles & Smith Co., San Francisco, Los Angeles, Portland; Motch & Merryweather Machinery Co., Cleveland, Detroit; Bowman Blackman Machine Tool Co., St. Louis.

Foreign Agents: Canadian Fairbanks-Morse, Canada; Fenwick, Freres & Co., France, Italy, Belgium, Switzerland, Spain, Portugal; Burton-Griffiths & Co., England; Rylander & Asplund, Sweden; Wynmalen & Hausmann, Holland; R. L. Scrutton & Co., Ltd., Australia.

THE "G & L" BORING, DRILLING AND MILLING MACHINES

Have Every Improvement and Refinement for Accurate Work



Design: The design of this machine is a product of many years of application. It is complete, symmetrical and simple in design and can be successfully operated by the ordinary mechanic. No improvement necessary for convenience, accuracy or productiveness has been overlooked. The gratifying results obtained by the many users prove its value.

Adaptability: The work is placed on the platen and the balanced headstock is adjusted vertically or the platen adjusted transversely or longitudinally as required. The operator is stationed convenient to the work and all controlling mechanism is placed directly before him.

Standard Specifications for No. o Size

Spindle Diameter	3 1/8 in.
Spindle Morse Tapper	No. 5.
Longitudinal Spindle Travel	26 in.
Vertical Spindle Travel	25 1/2 in.
Max. Distance Table to Spindle	26 in.
Max. Distance Spindle to Outer Support	60 1/2 in.
Size of Table	24 in. x 50 in.
Traverse Table Travel	30 in.
Longitudinal Table Travel	32 in.
Spindle Speeds in each direction	16
Speed of Driving Pulley	300
Approximate weight	9500 lb.
Weight Boxed	11,300 lb.
Cubical Contents	400 cu. ft.

Special specifications upon request.

Steel gearing, ball bearings and phosphor bronze bushings throughout. Further details in illustrated circular. Send for it.



UNIVERSAL BORING MACHINE CO.

HUDSON, MASS.

A UNIVERSAL (HORIZONTAL) BORING MACHINE

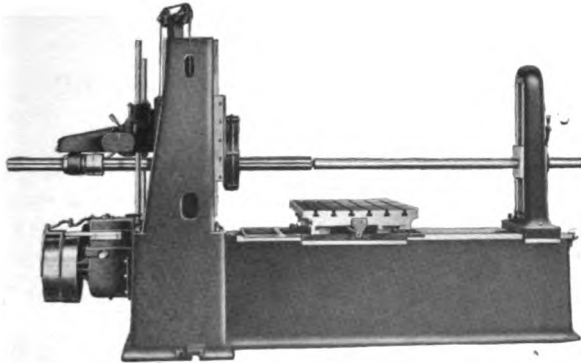
Rapid Milling

Feeds

Both

Vertical and

Horizontal



STANDARD SPECIFICATIONS

Size of Machine	No. 3½	No. 3-A
Diameter of Main Boring Bar.....	3½"	3"
Taper hole in Main Boring Bar, Morse.....	No. 6	No. 5
Travel of Main Boring Bar, Automatic.....	30"	28"
Travel of Main Boring Bar, by resetting.....	54"	56"
Size of Table.....	30" x 48"	24" x 48"
Power cross feed to Table.....	36"	36"
Power longitudinal feed to carriage.....	56"	38"
Power vertical feed to head.....	30"	26"
Maximum distance from table to center of bar.....	30"	26"
Greatest distance from face plate to outer support.....	84"	60"
Number of Spindle speeds.....	16	16
Range of Spindle speeds (about R. P. M.).....	15 to 200	15 to 200
Number of feeds (in either Direction).....	9	9
Range of feeds (inches per minute).....	¾ to 5½"	¾ to 5½"
Speed of Driving Pulley (R. P. M.).....	250	230
Shipping weight, crated, about.....	11,000 lbs.	9500 lbs.

343

Regular Equipment

For No. 3½ Machine.

One 3" Plain Extension Boring Bar, with No. 6 Morse Taper at one end.
Five Drill Sleeves and necessary cranks and wrenches.

For No. 3-A Machine.

One 2½" Plain Extension Boring Bar, 50" long, with No. 5 Morse taper at one end.
Four Drill Sleeves and necessary cranks and wrenches.

Special Equipment

Special Tables, Rotary Tables, Star Feed Facing Head, 2½", 3", 8", 10", 12" face milling cutters.

Send for Catalogues.

NILES-BEMENT-POND COMPANY

GENERAL OFFICES: 111 BROADWAY, NEW YORK

OFFICES AND AGENCIES

BOSTON	PHILADELPHIA	BIRMINGHAM	PITTSBURGH	CINCINNATI	CLEVELAND
DETROIT	CHICAGO	ST. LOUIS	SAN FRANCISCO	LONDON	

Manufacturers of Steam Hammers, Electric Traveling Cranes and Complete Machine Tool Equipments for General Machine Shops, Railroad Shop, Ship and Navy Yards and Heavy Ordnance or Small Arms Arsenals



MACHINE TOOLS

We build a very complete line of machine tools, including lathes; planers; boring mills; slotters; drilling machines; milling machines; shapers; boring and drilling machines; boring, drilling and milling machines; locomotive, car and axle machines, etc.

STEAM HAMMERS

Bement Steam Hammers are built in single-frame, double-frame and drop-hammer types. They are entirely dependable and are so designed that with very little attention they can be operated continuously without breakdowns. In their construction only the best material and workmanship are used.



TRAVELING CRANES

We build various types of Electric Traveling Cranes, trolleys and hoists. They are designed to obtain the highest operating efficiency with the lowest cost of maintenance. We are at all times ready to aid you in the solution of your handling problems.



PRATT & WHITNEY COMPANY PRECISION MACHINE TOOLS

Pratt & Whitney Precision Machine Tools include bench lathes, engine lathes, turret lathes, hand screw machines, hand, automatic, thread and spline milling machines, die sinking machines, profiling machines, surface grinding machines, vertical shapers, etc. Also rifling and deep hole drilling machines and complete equipments for arsenals consisting of machines for finishing all parts, both metal and wood, and include all necessary jigs and fixtures, as well as complete sets of gauges to insure interchangeability.

P. & W. MACHINISTS' SMALL TOOLS

include taps, dies, reamers, milling cutters, drills, etc., etc.

P. & W. STANDARDS AND GAUGES

Catalogs, Circulars and Full Information upon Request.

T. C. DILL MACHINE COMPANY, INC.

PHILADELPHIA, PA., U. S. A.

Builders of Slotters

The "DILL SLOTTER"

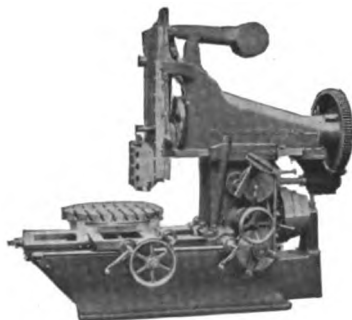
In the design of the "Dill Slotter," to meet the demands of today, it was plain that a departure was necessary and that procedure must be in at least two directions: First, that the machine must be able to produce a greater amount of work and that work must be more accurate. Second, that it must have a much greater range and not be confined only to the ordinary slotter work, but also reach out into other fields of usefulness; and, besides all this, it must be, if possible, more durable. The following features, which for the most part are exclusive, show how this Slotter meets the above requirements.

The GENERAL CONSTRUCTION of the "Dill Slotter" throughout is such as to insure efficiency and durability. It is constructed of the best material for the purpose; the gears are all cut from solid metal and mostly of forged steel; flat bearing surfaces are all hand-scraped to surface plates and are of ample dimensions. Gears, shafts, etc., are readily accessible for inspection. The convenience of operation is of special merit; while it is operative from one point principally, hand feeds are provided on all sides.

Attributes

15 Inch Slotter. Belt or Motor Driven

- A Traveling Head—Greatly increases the range of the machine.
- A Quick Traverse Gear—A great time and labor saver.
- New Quick Return—Permits high and uniform cutting speeds.
- New Intermittent Feed—For feeding heavy work at high speeds.
- An Automatic Knock-Off—A safety device for the feed mechanism.
- A Stroke Indicator—Quite indispensable; nothing like it.
- A Hand Wheel Controller—A good thing, and in the right place.
- A Tool Post in the Relief Apron—Very handy in changing tools.
- Six Changes of Speed—About four is the usual number.
- Belt and Motor Driven—Designed for both; not a make-shift.
- Powerfully Geared—About double the usual ratio.



345

Arranged for Belt Drive

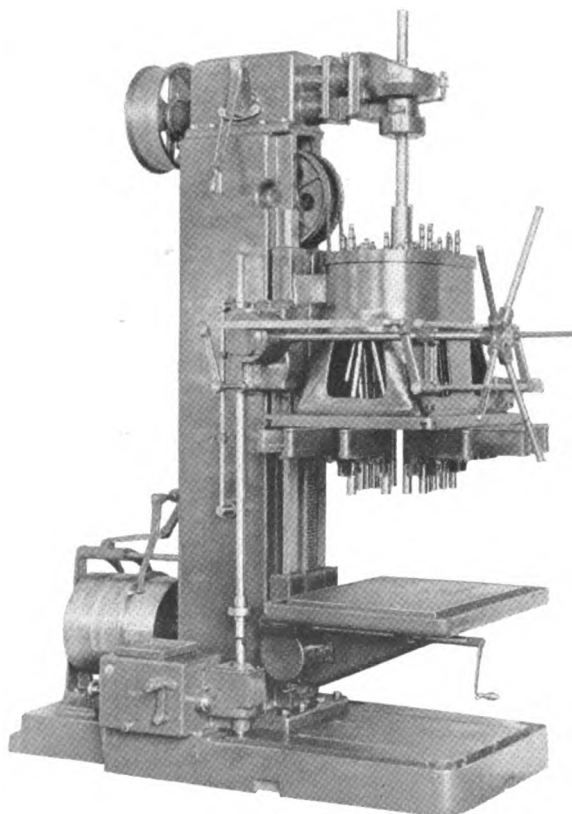
PRINCIPAL DIMENSIONS

Size of machine, in.	10	10-12	15	15-18	20	20-24
Maximum stroke, in.	10½	12½	15½	18½	21	25
Longitudinal movement of table, in.	28	28	36	36	48	48
Transverse movement of table, in.	20	20	30	30	40	40
Diameter of table, in.	24	24	34	34	44	44
Movement of head, in.	15	15	20	20	30	30
From table to head, in.	12	12	19¼	19¼	24½	24½
Adjustment of ram, in.	16	16	23	23	32	32
Will cut to the center of circle of.	54 in.	54 in.	72 in.	72 in.	92 in.	92 in.
Will cut to outside of circle of.	54 in.	54 in.	90 in.	90 in.	108 in.	108 in.
Strokes of ram per minute, r. p. m.	11½-85	10-76	8-48	7-43	6-31	5½-27
Feed of table per stroke, in.	0.011	0.011	0.010	0.010	0.0069	0.0069
Circular feed per stroke at 12 in. dia. (in.)	to 0.154	to 0.154	to 0.187	to 0.187	to 0.138	to 0.138
Feed of head per stroke, in.	0.0187	0.0187	0.011	0.011	0.0055	0.0055
Ratio of gears from cone pulley shaft.	to 0.261	to 0.261	to 0.196	to 0.196	to 0.11	to 0.11
Size of countershaft pulley, in.	0.0055	0.0055	0.005	0.005	0.00345	0.00345
Speed of countershaft, r. p. m.	to 0.077	to 0.077	to 0.093	to 0.093	to 0.069	to 0.069
Horsepower of motor.	12 to 1	12 to 1	18 to 1	18 to 1	24 to 1	24 to 1
Speed of constant speed motor, r. p. m.	14 x 3½	14 x 3½	20 x 4	20 x 4	26 x 5	26 x 5
Speed of adjustable speed motor, r. p. m.	200	180	200	180	200	180
Net weight, lbs.	3	3	5	5	10	10
Code word.	1,200	1,000	1,200	1,000	1,200	1,000
	400 to	400 to	400 to	400 to	400 to	400 to
	1,200	1,200	1,200	1,200	1,200	1,200
	5,750	6,000	11,000	11,500	25,000	26,000
	Umnoj	Ummuk	Ummyl	Umnag	Umneh	Umnij

NATIONAL AUTOMATIC TOOL CO.

RICHMOND, INDIANA

Manufacturers of Multiple Drills with Patented Independent Change of Speed for Each Spindle



MULTIPLE DRILLS

Natcos are built in 9 different sizes with spindle equipment as desired.

Natco Patented Independent Change of Speed for each Spindle makes possible the Drilling, Tapping, Reaming, or Counter-boring of various sized holes simultaneously with each tool running at approximately correct cutting speed.

Natco one nut adjustable arms and patented cluster plate make quick adjustment and complicated spindle layouts possible.

Natco patented Universal Joints are guaranteed for one year.

Natcos equipped with 22", 34" or 44" Rotary Tables have no idle moments. They drill, ream, or tap while you load.

TURNER MACHINE COMPANY

Incorporated with Turner, Atherton & Co., Ltd., Denton, Manchester and Stockport, England

DANBURY, CONN., U. S. A.

AND NEWARK, N. J.

Manufacturers of Turret Machine Tools. Also Owners and Manufacturers of the QUINT Vertical Turret Drilling, Tapping, and Chucking Machines

Reduce Costs—Increase Output—Improve Quality

Install A

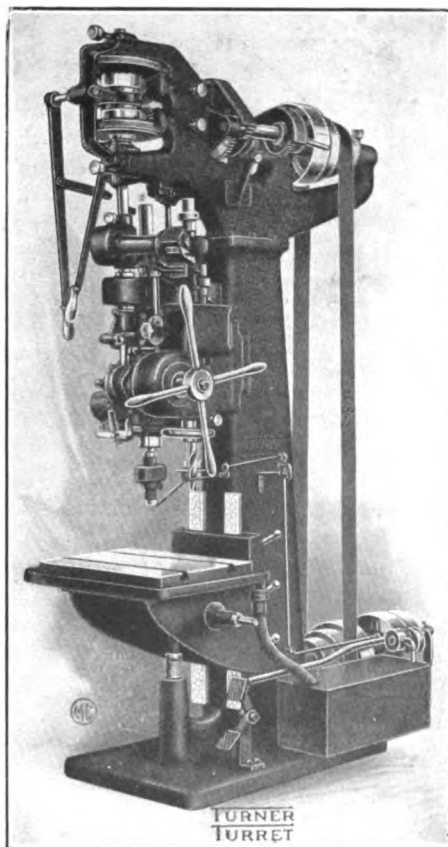
TURNER TURRET

The Turner Vertical Turret is a machine of practical design, rigid construction and wide adaptability—a machine that cuts operation time to closest limits, turns out accurate work and does not require a skilled operator. Its great utility is of particular value in solving the mechanical problems of Drilling, Reaming, Facing, Boring, Threading, etc. Turner Turret production on many parts, especially those of irregular shape, is much more rapid than on a turret lathe.

Speed and ease of operation in Turner Turrets are not obtained at cost of accuracy. All 'round efficiency and ability to turn out better work in less time are characteristics of Turner Turrets which have resulted in their adoption by scores of leading manufacturers in America and Europe.

**Send Us a Sketch of
Your Worst Job**

of machining and we'll give you an idea of what handy, economical Turner Turrets can do for YOU.



Model F

Turner Turrets are built in several sizes, so constructed that a series of operations may be completed without changing the position of the work or tools. Spindles carry different tools which successively and automatically register in precisely the same position. Range of Tapping $\frac{1}{8}$ " to 3".

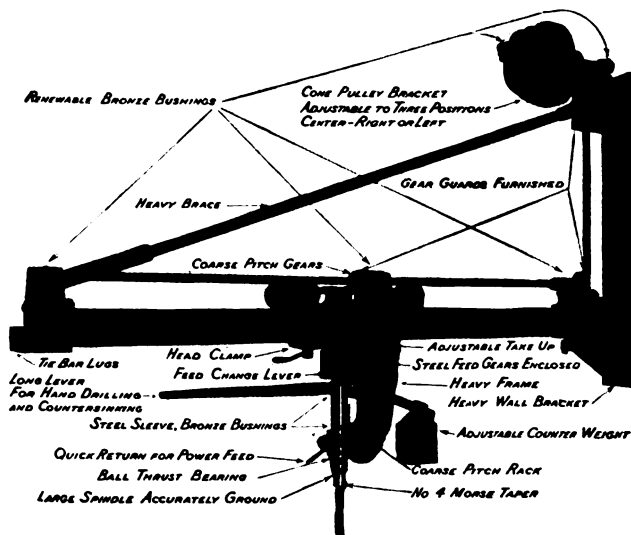
Write us for complete details of these labor, money and time saving machines. Ask for catalog "AA."

There's a model that will solve your production problems and increase your output.

LYND-FARQUHAR CO.

BOSTON, MASS.

Machine Tools



LYND-FARQUHAR WALL RADIAL

Is Easy to Handle

This is a real machine tool. Careful design and high-grade materials contribute to its great success and economy. The illustration shows how well built it is.

Much wider range is possible on this drill than the ordinary radial. The head is exceptionally rigid. Yet it moves with extreme ease from end to end of the arm. For the crowded shop this drill is ideal, for it takes up little space, and when not in use can be pushed out of the way.

Made in four standard sizes:

Size	Drills to Center of	Wall to End of Arm	Net Weight, Lbs.
7 ft.	14-ft. circle	10 ft. 4 in.	3380
9 ft.	18-ft. circle	12 ft. 4 in.	3483
11 ft.	22-ft. circle	14 ft. 4 in.	3615
13 ft.	26-ft. circle	16 ft. 4 in.	3750

Other special lengths of arm can be furnished to suit requirements.

Write us for complete information and prices.

ENGINE LATHES, RADIAL DRILLS, UPRIGHT DRILLS, SHAPERS, PLANERS, SCREW MACHINES, COLD SAW CUTTING OFF MACHINES, GRINDING MACHINERY, PRECISION MACHINERY AND SPECIAL METAL WORKING MACHINERY have been furnished by us to the large manufacturers throughout the country. Let us know your requirements, and we are in a position to serve you to advantage.

THE FELLOWS GEAR SHAPER CO.

SPRINGFIELD, VERMONT, U. S. A.

Sole Makers of Gear Shapers and Gear Shaper Cutters

THE FELLOWS HELICAL GEAR SHAPER

This machine is designed to cut the teeth in helical gears by the generating process. The cutter is ground after hardening to the correct involute form. The Fellows Helical Gear Shaper is designed for producing accurate, quiet running gears in large quantities. That it meets these requirements is attested by the fact that the manufacturers of high-grade automobiles are using it for cutting timer gears.

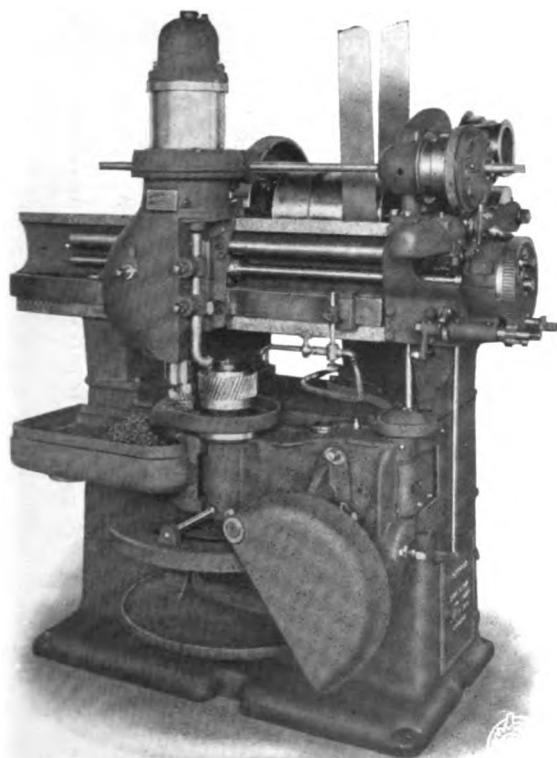
It works on exactly the same principle as the spur machine and the movement of the cutter is controlled by means of helical guides, right- and left-hand guides being supplied with the machine. The cutters are in pairs, right- and left-hand, the helix angle corresponding accurately to that of the gears being cut.

The No. 65 Helical Gear Shaper cuts external helical gears up to 26" pitch diameter, 5" face, $\frac{6}{7}$ diametral pitch; internal helical gears up to 24" pitch diameter, 3" face, $\frac{6}{5}$ diametral pitch.

The No. 6 Gear Shaper cuts external spur gears up to 35" outside diameter, 5" face, 4 diametral pitch, and internal spur gears up to 24" pitch diameter, 3" face, 4 diametral pitch.

NOTE—We have published several interesting pamphlets dealing with Gearing and Gear Cutting, copies of which will be sent upon request to those interested.

349



**No. 65
Fellows
Helical
Gear
Shaper**



HIMOFF MACHINE COMPANY

NEW YORK, U. S. A.

SALES OFFICE
50 Church Street, New York City

MAIN OFFICE AND WORKS
Astoria, in the City of New York

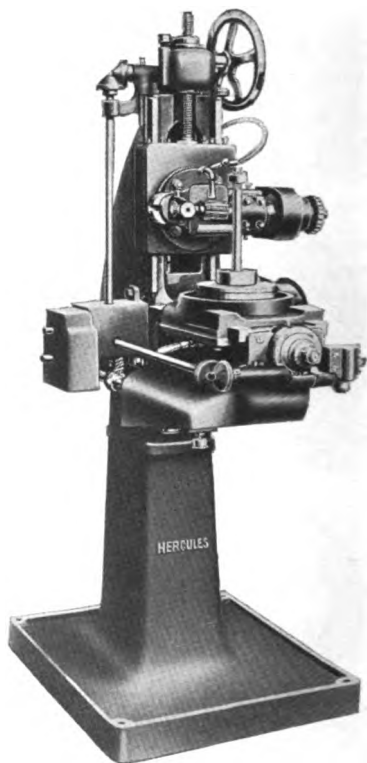
HERCULES EIGHT-INCH GEAR HOBBER

The method of manufacturing gears with the use of the hobber is now generally understood and appreciated. The hob may be described as a spiral circular rack, the thread on which is identical to a rack of an equal pitch.

One hob of each pitch is required when cutting gears of any number of teeth. The same hob can be used to cut spirals of either right or left hand to 70 degrees. The teeth curves are generated by the relative rotative motion of the hob and the work.

Hobbing is a continuous cutting operation, therefore this system makes it possible to produce a greater quantity of gears in the same cutting time than the practice followed in the past. In all other systems of gear cutting, there are idle or non-productive strokes.

The Eight Inch "Hercules" Gear Hobber, as illustrated, has been designed especially for the rapid and economical production of small gears such as used in phonographs, meters, typewriters, moving picture apparatus, adding machines, instruments of precision, and, in general, all gear cutting up to ten pitch in steel, eight pitch in cast iron or brass. It will cut spur, spiral and worm gears, and is fully automatic.



SPECIFICATIONS

Capacity, diametrical pitch steel.....	10	Speed of countershaft.....	180 and 360 R. P. M.
Outside diameter of largest gear cut...	8"	Floor space.....	24 x 36
Width of largest gear.....	6"	Net weight, about.....	1050 lbs.
Minimum distance from center of work arbor to center of hob mandrel.....	3 1/4"	Domestic shipping weight, about	1250 lbs.
Diameter of clutch pulleys on countershaft.....	8"	Export shipping weight, about...	1350 lbs.
Width of clutch pulleys on countershaft.....	3"	Telegraphic code name.....	"Reag"

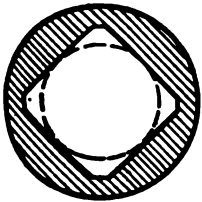
Regular equipment:—1 hob arbor, 3/4" diameter; 1 work arbor, 3/4" diameter; 1 set of change gears cutting up to 360 teeth; 1 set of change feed gears; wrenches; chart.

THE LAPOINTE MACHINE TOOL CO.

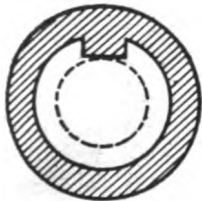
HUDSON, MASSACHUSETTS, U. S. A.

Manufacturers of Machines, and Tools for Broaching

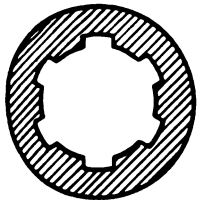
LAPOINTE BROACHING MACHINES are made in four different sizes, No. 1, No. 2, No. 3, and No. 4. Any size can be arranged for motor drive either direct connected or silent chain drive. These machines are designed for strength, rigidity, durability, convenience of operation, and adaptability for all classes of work required of a Broaching Machine. The small machines are used for cutting single keyways and broaching small square holes, or any other broaching work within their capacity. The larger machines are used extensively for broaching multiple spline holes, Internal Gears, large square, hexagon and rectangular holes, also for sizing round holes up to 5" in diameter.



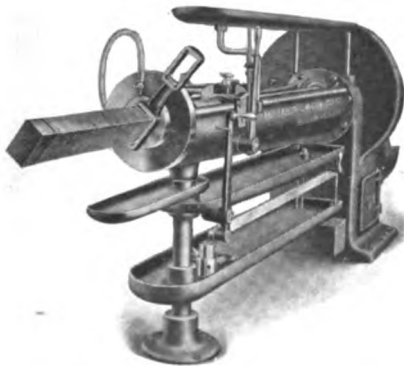
From Round to Square in Less than One Minute



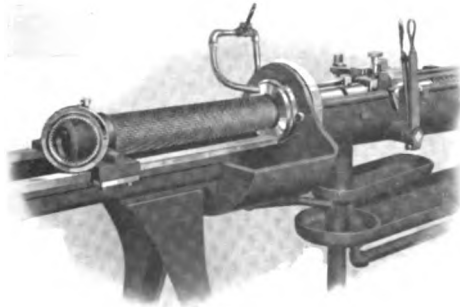
From Round to Solid Key in Less than Two Minutes



From Round to Six Spline in Less than One Minute



No. 4 Machine: Capacity to cut keyways 4" wide or broach square holes in steel up to 4" across flats from a drilled hole



Broaching two 5" x $\frac{1}{2}$ " Steel Internal Gears in One Minute

The manufacture of broaching tools is a specialty that requires not only expert toolmakers but a great many special machines, together with all the modern appliances for hardening, tempering, and straightening broaches. We are the pioneers in this industry and our product is the result of nearly twenty years' experience. Every broach is tested for strength and accuracy before being shipped.

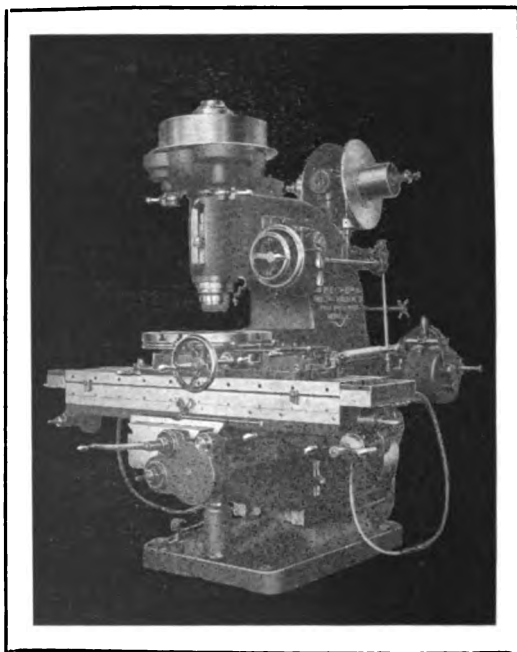
The oldest and largest concern in this line of business.

BECKER MILLING MACHINE CO.

FACTORY AND OFFICES AT

HYDE PARK, BOSTON, MASS.

Milling, Routing and Die Sinking Machines, Milling Cutters



THE BELT DRIVEN MILLING MACHINE

Superiority of the direct belt driven milling machine over the gear driven type is daily becoming more evident to the up-to-date manufacturer.

As we have specialized on the belt driven milling machine we can positively recommend the BECKER BELT DRIVEN HIGH POWER MILLING MACHINES for reasons like these:

- They consume $\frac{1}{2}$ - $\frac{2}{3}$ less power than other machines of corresponding size.
- They have a patented roller feed and a positive non-slipping belt drive.
- They combine rigidity of construction and smoothness of operation.

THEY HOLD AN UNBEATEN RECORD FOR OUTPUT SPEED.

THE BILTON MACHINE TOOL CO.

BRIDGEPORT, CONN., U. S. A.

Manufacturers of Automatic Gear Milling Machines, Gear Hobbing Machines, Automatic Milling Machines, Automatic Slitting Machines for Knitting Machine Trade, Plain and Ball Bearing Sensitive Drill Presses, Plain Milling Machines, Riveting Machines

AUTOMATIC GEAR MILLING MACHINES

Made in 3 sizes for spur or bevel gears.

No. 1	1½	4" dia.	14 pitch
No. 2	2½	6" dia.	10 pitch
No. 3½		8" dia.	8 pitch

These machines can be adapted to a large variety of special form milling which can only be done to advantage on these machines. Used on milling cutters, reamers, taps, cylinders, also small worms with attachment.

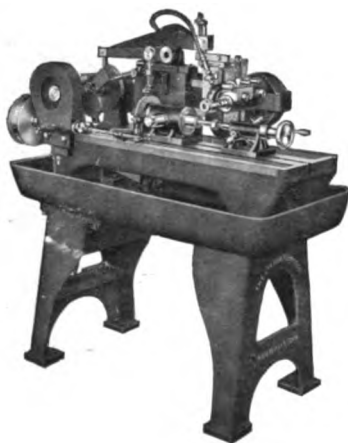
Our catalogue No. 15 shows what can be accomplished.

SPECIAL FEATURES

- Entirely automatic action.
- Positive and direct indexing to the work.
- Cutter clears work while indexing.
- Quick releasing fixture for removing work.
- Large production through quick action of machine.

Exceptional wide range of usefulness.

The above sizes are also made in vertical type, used for milling and slotting sinker rings, dials, plates, milling cutters. Range up to 18" dia.



UNIVERSAL GEAR HOBBIING MACHINES

Capacity: 10" dia.

10 pitch

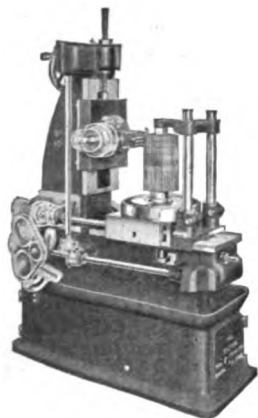
10" width of face

weight 2100 lbs.

Will automatically hob spur spiral gears, worms and worm gears, also variety of special shapes.

Base and oil pan extra heavy with liberal reinforcements to absorb vibration. Work table driven by large bronze worm gear and worm and automatically lubricated. Machine uses least possible number of feed and index gears. Hob spindle bored for No. 9 B & S Taper, driven by Helical gear 8-10 pitch. Machine entirely of latest design with new feature to increase production without sacrificing accuracy.

Send for catalogue.



Plain Horizontal Knee and Column Type Milling Machines, 27"x 8"x 18", weight 500 lbs.

High Speed Ball Bearing Drill Press, ¾" capacity, 4 and 6 spindle.

Automatic Cam Feed Drill Press, ½" capacity, weight 1800 lbs.

MILL-IT-AUTOMATIC Machines for automatic milling.

FOREIGN AGENTS: Chas. Churchill Co., Alfred Herbert, M. Mett. Eng. Co.

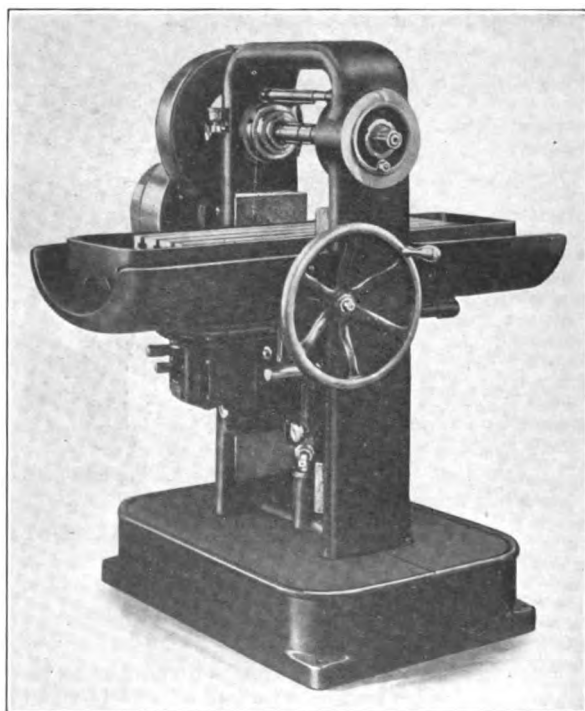


GOOLEY & EDLUND, INC.

CORTLAND, N. Y., U. S. A.

Manufacturers of High Duty Milling Machines

BRIGGS MILLING MACHINES



FEATURES:

—
**CONVENIENCE
OF OPERATION**

—
**HIGH
PRODUCTION**

—
RIGIDITY

—
POWER

—
SIMPLICITY

—
ALIGNMENT

—
**AMPLE MEANS
FOR
LUBRICATION**

—
WORKMANSHIP

—
DURABILITY

A manufacturing machine particularly adapted to the making of automobile, gun and similar parts where close limits and smooth cutting are required in the rapid production of duplicate parts.

A radical departure has been made from conventional milling machine design to secure greater rigidity and power than is possessed by any other machine of corresponding size and weight. The solid arched frame with the heavy bed strongly gibbed to both sides give a rigidity of relation of arbor to table which is not disturbed by the stress and vibration of heavy cuts of high speed or hard steels.

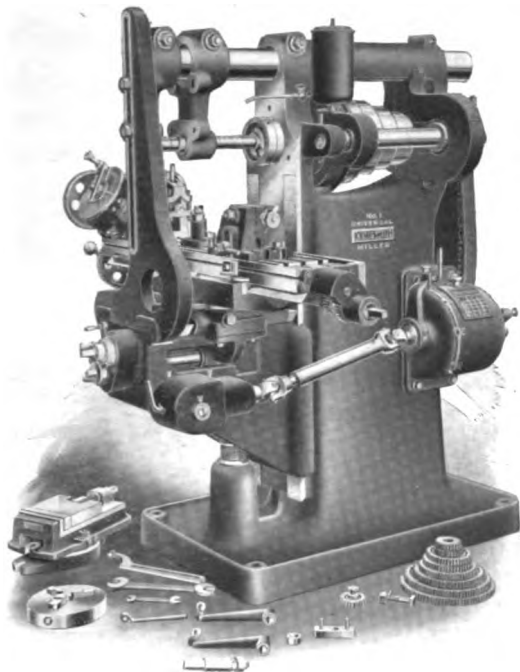
The powerful rigid feed, quick table return, ease and speed of handling, and simple and rigid construction are a few of the good features which we would like to tell you more about.

THE KEMPSMITH MFG. CO.

MILWAUKEE, U. S. A.

KEMPSMITH MILLING MACHINES

both plain and universal, are built in a wide range of sizes, adapting them for use on all classes of work, from the finest precision instruments up to the heaviest automobile and aeroplane engines, tractors and agricultural machinery.



Kempsmith Universal Miller with Full Equipment

355

DIMENSIONS	PLAIN			UNIVERSAL		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
Longitudinal table feed, Power.....	22"	28"	34"	22"	28"	34"
Transverse feed { Hand	8"	9"	11"	7½"	8½"	10"
Power						
Vertical feed..... { Hand	19"	19"	20"	18"	18"	19"
Power	42½"x10"	45"x10"	54"x12"	39½"x8¼"	45"x10"	52"x12"
Table, working surface						
Face of column to harness brace, in position	17"	20"	22"	17"	20"	22"
Spindle—taper hole (B & S).....	No. 10	No. 10	No. 11	No. 10	No. 10	No. 11
Cone, diam. largest step	10½"	12½"	13¼"	10½"	12½"	13¼"
Cone, number of steps.....	4	4	3	4	4	3
Belt, width.....	2½"	3"	3½"	2½"	3"	3½"
Spindle speeds, number	16	16	18	16	16	18
Vise, size and type.....	No. 3-Pl.	No. 3-Pl.	No. 4-Pl.	No. 3-Sw.	No. 3-Sw.	No. 4-Sw.
Arbor, diam. and length	1"x10½"	1"x10½"	1½"x14"	1"x10½"	1"x10½"	1½"x14"
Floor space, direction of spindle.....	56"	62"	66"	56"	62"	66"
Floor space, direction of table.....	90"	97"	114"	85"	97"	112"
Net weight.....	2750 Lbs.	3150 Lbs.	4500 Lbs.	3100 Lbs.	3600 Lbs.	5000 Lbs.
Domestic shipping wt.....	2900 Lbs.	3400 Lbs.	4800 Lbs.	3250 Lbs.	3800 Lbs.	5300 Lbs.
Export shipping wt.....	3400 Lbs.	4000 Lbs.	5200 Lbs.	3600 Lbs.	4200 Lbs.	5800 Lbs.
Dimensions of case for export, large box.....	67x36x66"	67x37x70"	72x40x72"	66x36x67"	67x37x70"	72x40x72"
small box.....			19x24x48"		19x24x48"	
Cu. ft. of export cases	92	101	133	92	101	133
Telegraphic code word.....	KEDIV	KEDGE	KEPER	KELK	KELPOT	KELSON

KEARNEY & TRECKER CO.

MILWAUKEE, WIS., U. S. A.

MILWAUKEE MILLING MACHINES

Double Over Arm

Constant Speed Drive

Automatic Flooded Lubrication

The Double Over Arm is clearly shown by the half-tone engravings and consists of two steel bars arranged accurately parallel with the spindle at sufficient distance apart to form a rigid truss when the arbor supports are clamped to them.

The Work Table is made of semi-steel and finished all over as experience has shown that where scale is left on one side the table does not long retain its accuracy.

The Box Section Knee has no slot through the top to close under pressure of the saddle clamp or strain of the cut.

The Flanged Spindle provides means for holding the cutters for driving in either direction. The clutch collar keyed to the face of the spindle provides an ideal drive for the arbors.

The Spindle Reverse is contained within the machine so that right- or left-hand cutters can be used without reversing the driving belt.

The Drive is through a single pulley running at a constant speed, giving 18 spindle speeds in geometrical progression of about 20 per cent.

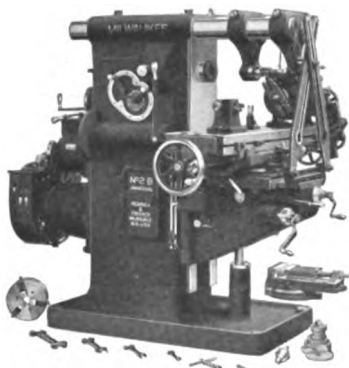
The Lubricating System consists of a reservoir in the base of the machine holding several gallons of machine oil that is pumped to the top of the machine and distributed by a perforated pipe to all gears and bearings in the main frame and feed box, flooding downward over all of these on its way back to the reservoir. All oil grooves are cut through so that the oil will wash away any foreign material and keep the bearings in condition.

A Cutter Lubricant Pump is provided on every machine as all machines are usually used on steel or other material requiring lubricant. Adequate provision has been made for the return of the lubricant to the reservoir.

Catalogue describing our complete production in detail, mailed on request.



NO. 2B PLAIN



NO. 2B UNIVERSAL



NO. 2 1/2 B VERTICAL

SLOAN & CHACE MFG. CO., LTD.

OFFICE AND WORKS

SIXTH AVE., COR. N. 13TH ST., NEWARK, N. J.

Manufacturers of Precision Machinery, Dies and Special Tools

PRODUCTS: Bench Lathes, Bench Milling Machines, Special Machinery, Jigs, Fixtures, Punches and Dies for Sheet Metal, Gauges, Countershafts, Etc.



No. 5½ Bench Lathe

NO. 5½" BENCH LATHE

With Compound Slide Rest

CAPACITY: 7" swing, 18" between centers (bed 35 inches long), 5/8" through draw-in spindle, 3/4" with draw-in spindle removed.

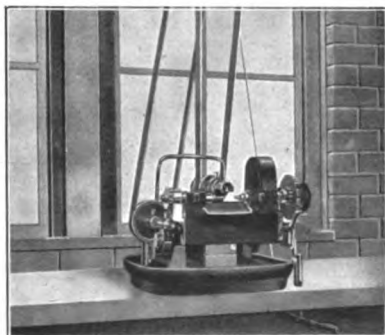
AUTOMATIC PINION CUTTERS

CAPACITY: No. 1, 3/4" diameter, 1" face; No. 2, 1 1/8" diameter, 1 1/4" face

Automatic Pinion Cutters are built in two sizes, designated as Nos. 1 and 2. The No. 1 machine (illustrated) has a capacity up to 3/4" diameter and 1" face. The No. 2 machine is similar in construction to the No. 1, but larger, and having a capacity for gears and pinions up to 1 1/8" diameter and 1 1/4" face.

These machines are designed for the rapid production of cut pinions and small spur gears for watches, clocks, meters, etc., and the No. 1 Automatic Gear Cutter will cut brass gears up to 3 1/2" diameter.

SPEEDS: Cutter spindle, 1600; worm shaft, 1200; countershaft, 750; cutter feed, 0.07 per revolution.



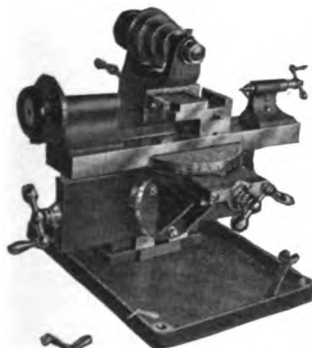
Automatic Gear and Pinion Cutter

BENCH MILLING MACHINES

Bench Milling Machine is designed for use in the tool room, or for experimental work, though it is adapted to some classes of manufacturing. It is mounted upon the bench, or a cast iron pedestal 36" high.

COUNTERSHAFTS

Suitable Countershafts are provided for all of our many different machines. Lathes are required to perform such a great variety of work and under such varying conditions that we have found it necessary to provide several kinds of countershafts for them. They are Wall or Ceiling Countershafts, both two and three speeds; Wall-Rod Countershafts, one and two speeds; Grinding Countershafts, used with either Wall, or Wall-Rod Countershaft.



Bench Milling Machine

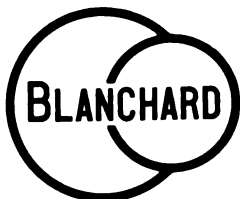
We build Special Machinery to individual order, assisting in its development and perfection. Fine Model Making and Gauge Work.

THE BLANCHARD MACHINE CO.

CAMBRIDGE, MASS.

Blanchard High Power Vertical Surface Grinders

Trade Mark



Reg. U. S. Pat. Off.

Direct Motor Drive Type
of BLANCHARD GRINDER.
Capacity 30" dia. x 12" high.
Also made in belted motor
and countershaft drive types.



358

Flat, accurate, *ground* surfaces furnish locating surfaces for subsequent machining operations, ensure instant, correct alignment in assembling, and present a superior appearance in the completed machine. The advantages of grinding plane surfaces have long been realized but the high cost has prevented the general use of this method of machining.

THE BLANCHARD HIGH POWER VERTICAL SURFACE GRINDER was developed to meet the need for an accurate, powerful tool to grind plane surfaces quickly and cheaply and able to finish directly from the rough casting or forging in one operation.

It is today machining plane surfaces on parts for

Airplane Motors
Automobiles
Ball Bearings
Compressors
Diesel Engines
Electrical Apparatus
Gas Engines
Jigs and Fixtures
Linotypes
Locomotives

Machine Tools
Ordnance
Pumps
Phonographs
Steam Engines
Sewing Machines
Shoe Machinery
Small Tools
Textile Machinery
Tractors

Turbines

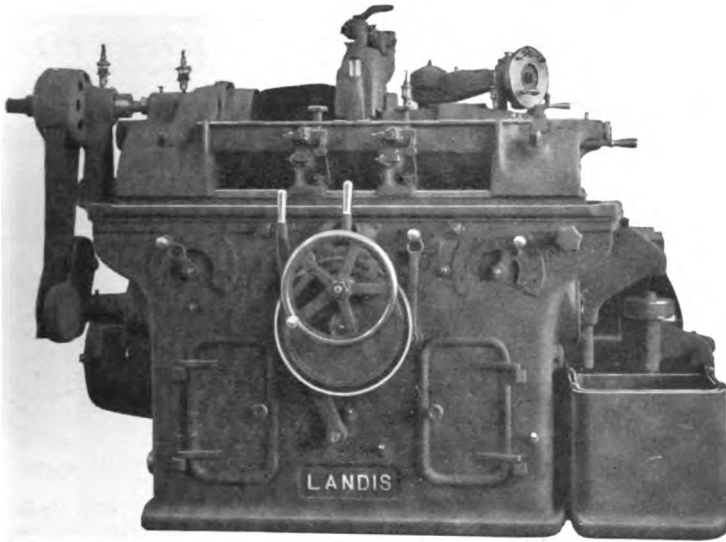
in hundreds of shops at a **great reduction in cost over former methods.** Numerous repeat orders from firms who have used BLANCHARD GRINDERS for several years past testify to their economy and sustained accuracy.

Descriptive catalog on request. Send blueprints or samples of your work for production estimates.

LANDIS TOOL COMPANY

WAYNESBORO, PA.

Manufacturers of Precision Cylindrical Grinding Machines



Improved Self-Contained Grinding Machine

359

Our regular line consists of the following types:

UNIVERSAL MACHINES No. 1, No. 1½, No. 2, No. 3, No. 4 are used for finishing tools and a variety of straight or taper parts, both external and internal, such as are common to the tool room, machine shop, railroad shops, etc.

Attachments, such as magnetic chuck, gear-cutter attachment, side mill grinding attachment, etc., can be used on these machines to advantage.

PLAIN GRINDING MACHINES. Sizes 6", 10", 12", 20", 30", 40" swings in standard lengths. These strictly manufacturing machines are intended for finishing straight and taper spindles, shafts, rolls, tubing and all other work which can be revolved on dead centers.

PLAIN GRINDING MACHINES WITH GAP are our 20" swing Plain Machines, built with gap in the bed to suit the location of the projection on the work. Especially suitable for grinding locomotive piston rods.

INTERNAL GRINDING MACHINES for straight and taper internal grinding and the fixtures for these machines will grind holes ¼" in diameter, or larger, and up to 12" long.

CRANK GRINDING MACHINES for grinding single or multiple throw crank shafts used in gas and small steam engines.

ROLL GRINDING MACHINES for grinding chilled iron and hardened steel rolls.

CAM GRINDING ATTACHMENTS (for use on our plain and universal grinders) for grinding either detachable or integral cams.

BALL BEARING RACE GRINDING MACHINES for grinding the raceways in radial, thrust and cone ball bearings.

Our illustrated and descriptive catalogues and literature give detailed information. They also describe the features which stand for quick manipulation, accurately finished work, durability of alignments and rapid production—all of which are prominent in the various types of Landis Grinding Machines.

LANDIS

TRADE MARK

MODERN TOOL COMPANY

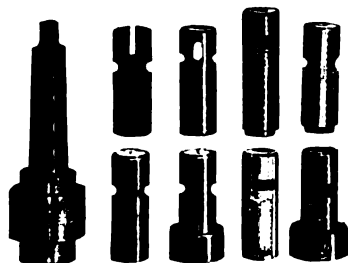
ERIE, PENNA., U. S. A.

Manufacturers of Self-Opening Dies, Hollow Milling Tools, Solid Dies, Collapsible Taps, Quick Change Chucks and Chaser Grinders

"MODERN" SELF-OPENING DIES AND COLLAPSIBLE TAPS



"Modern" Threading Tools are universal in their application and use, being adapted for revolving spindles as well as turret lathes and screw machines. A single style of Die or Tap will cut any form or pitch of thread, of any diameter within the capacity of the respective heads. "Modern" Die Heads are made in sizes to thread any diameter from $\frac{1}{16}$ " to 6", and the range of "Modern" Collapsible Taps is from $\frac{3}{4}$ " to 3".



"Magic" Chuck and Collets

"MAGIC" CHUCK EQUIPMENT

For the rapid changing of tools in drill press, lathe, screw machine, etc., without stopping the machine, practically converting a single spindle machine into a multiple spindle one, with as many tools as you may have operations. Made in six sizes, the largest with capacity up to 5" diameter drills. Try it and save labor costs.

"MODERN" CHASER GRINDERS

To all users of threading dies who value accuracy and correctness in gauge of threads, we recommend the use of machine ground chasers or threading dies.

The "Modern" Chaser Grinder was especially designed for grinding chasers of the "Modern" Die Head, but is equally efficient for chasers of any style or make of die, providing the chasers have parallel sides. We also furnish a number of special fixtures with this machine, by the use of which Spring Dies, Pipe Dies, Reamers, Spiral and End Mills, Milling Cutters, etc., may be successfully ground to advantage.

This machine is simple in construction, inexpensive to maintain, easy to operate and it will save much valuable time in the grinding of your small tools.

Modern Chaser Grinders are made for belt drive or a complete motor driven unit.



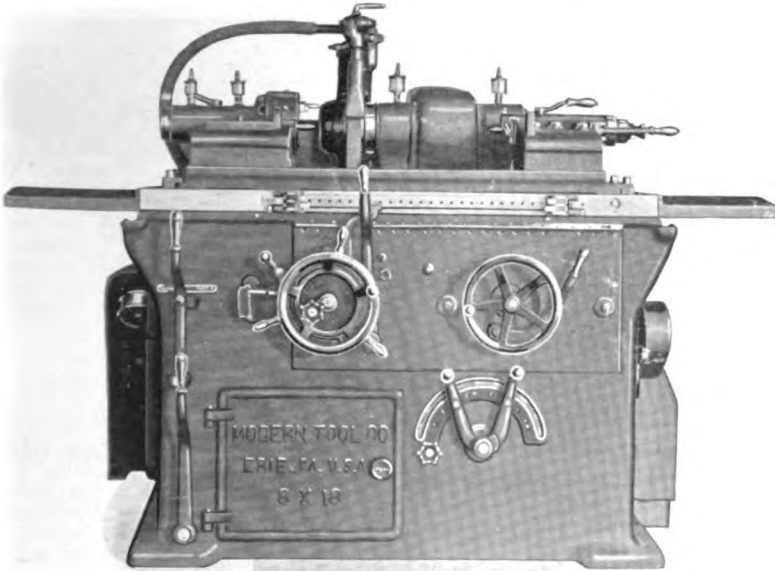
Modern Chaser Grinder

MODERN TOOL COMPANY

ERIE, PENNA., U. S. A.

DISTRICT OFFICES: NEW YORK, CHICAGO, DETROIT AND CINCINNATI
Rudel-Beinap Machinery Co., Montreal and Toronto, Canada
Leo C. Steinle, 53 Victoria St., London, S. W., England
H. Miguel Mateu, Barcelona, Spain
Rylander & Asplund, Stockholm, Sweden

Manufacturers of "MODERN" Cylindrical Grinding Machines



8" x 18" Self-Contained Plain Grinding Machine

PLAIN SELF-CONTAINED GRINDING MACHINES—Sizes 8"—12"—16" swings; 18"—24"—30"—36"—48"—60" between centers.

These machines have a single constant speed drive, which reduces the cost when equipping the machines with motors. The main drive is in the rear of the machine and power is applied either from the line shaft by a single belt or by motor connection.

UNIVERSAL GRINDING MACHINE—External and Internal in combination. Capacity 13" swing, 40" center distance. For the tool room or machine shop, with many advantages for manufacturing—and improved operative features; counter shaft equipped with roller bearings throughout.

INTERNAL GRINDING MACHINE—Swings 10", grinds 10" deep—a manufacturing machine designed for grinding all varieties of gears, sleeves, cutters, collets, bushings, cam rings, valves, roller bearings and work of a similar class.

The above types are strictly manufacturing machines, designed to withstand the class of service required of grinding machines of this character, and embody many new and improved features which enable them to produce accurate, highly finished parts, rapidly and economically.

Send for illustrated literature.

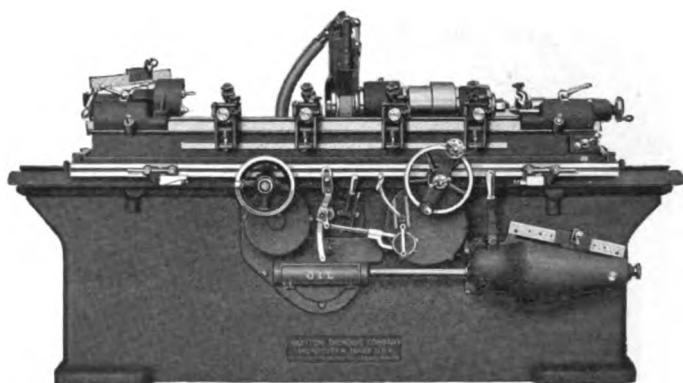
NORTON GRINDING COMPANY

WORCESTER, MASS., U. S. A.

Cable Address: "GRINCO"

A. B. C., Lieber's, Business, New Business and Western Union Codes

Manufacturers of Grinding Machinery



PLAIN MACHINES FOR CYLINDRICAL GRINDING

SWING—3"—6"—10"—14"—16"—18"—20"—22"—24"—26", and of
VARIOUS LENGTHS between centers.

SURFACE GRINDING MACHINES

WIDTH OF TABLE —15", distance between wheel and table 15".
LENGTH OF TABLE —6'—8'—10'—12'—14'.

CRANK SHAFT GRINDING MACHINE

UNIVERSAL TOOL AND CUTTER GRINDING MACHINES

SIZE No. 1. CAPACITY 8" or 10", SWING 15" between centers.

SIZE No. 2. " 10" or 12", " 32" " "

ROLL GRINDING MACHINES

BUILT TO ORDER.

CAR WHEEL GRINDING MACHINES

For grinding mounted car wheels while revolving on their own journals.

RUNNING BALANCE INDICATING MACHINES

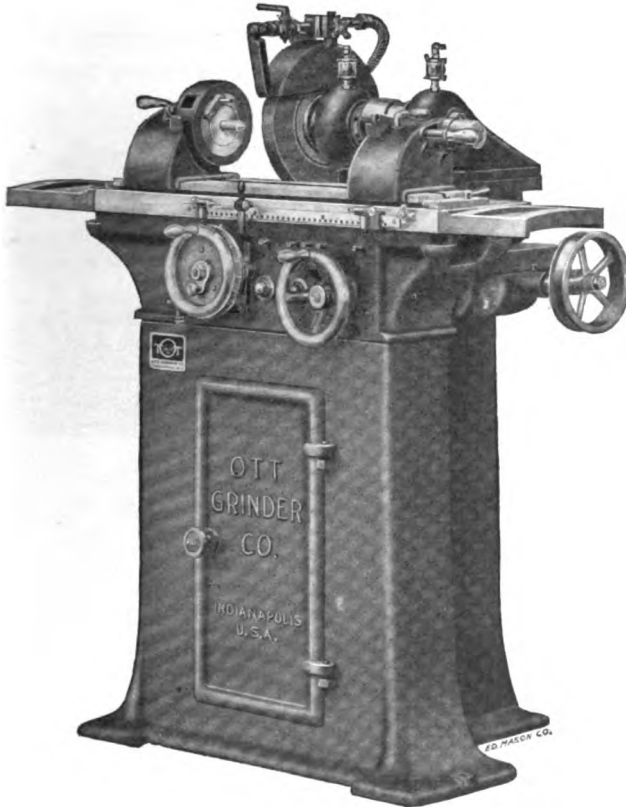
This machine is made for locating errors in running balance of revolving parts. Particularly adapted for automobile crankshafts, fly-wheels and clutches. Also armatures for small motors.

Send for Illustrated Literature.

OTT GRINDER CO.

INDIANAPOLIS, IND.

Manufacturers of Cylindrical Grinding Machines



5' x 8' Plain

5' x 8' Plain—Wheel 10' x 1 1/4'

This machine is especially adapted for the economical production of small duplicate straight or taper cylindrical parts requiring close limits. A wheel up to 2' face can be used. Furnished with Automatic Feeds or Hand Feed only.

Universal 10' x 32"—Wheel 12' x 1 1/2'

This Universal machine is especially adapted for general tool room service, for finish cylindrical grinding, straight and taper, chuck and face plate work both internal and external and especially for general manufacturing grinding in above ranges and capacities.

Greatest possible care and attention is given the manufacture of these machines; the materials used are the very best for their respective places and duties.

A complete system of inspection, first of the individual parts, then the assembly units and finally machine completed, "run and tested" insures the purchaser a perfect Grinder ready for instant use and production.

Illustrated and descriptive bulletins with detail specifications gladly furnished.

UNIVERSAL GRINDING MACHINE CO.

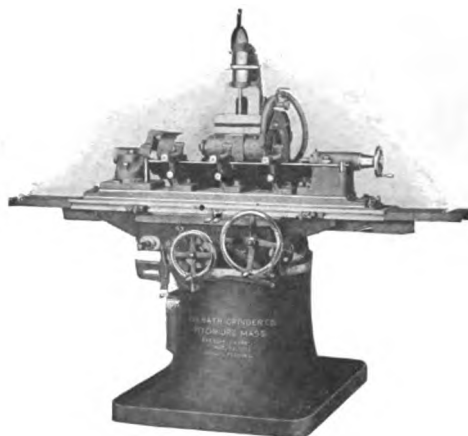
FITCHBURG, MASS., U. S. A.

Cable Address "Bath," Liebers Code

Manufacturers of Grinding Machinery

BATH UNIVERSAL GRINDING MACHINES

For Cylindrical, Internal, Surface, Tool and Cutter Grinding



The Bath Grinding Machines are built from entirely new designs, embodying many distinctive and desirable features essential for rapid and accurate production of commercial and tool room grinding. They have been designed for the purpose of combining in a single machine efficient means for the grinding of Cylindrical, Internal, Surface, Disc, Cutter and Reamer work of all descriptions.

In this machine are incorporated all the essential features necessary for performing the various grinding operations with as much rapidity and accuracy as could be accomplished on a single purpose machine, being so designed that the changing of machine from one operation to another is reduced to a minimum. Particular attention is called to the massive proportions of the bed, column, knee, table, etc., the wide range of work and traverse speeds, liberal bearings, the accuracy of our automatic feeds, and the centralized location of operation at the front of table.

Made in 3 Sizes

- No. 1 10" swing 20" between centers wheel 10" x $\frac{3}{4}$ "
- No. 2 10" swing 25" between centers wheel 12" x $1\frac{1}{2}$ "
- No. $2\frac{1}{2}$ 10" swing 36" between centers wheel 12" x $1\frac{1}{2}$ "

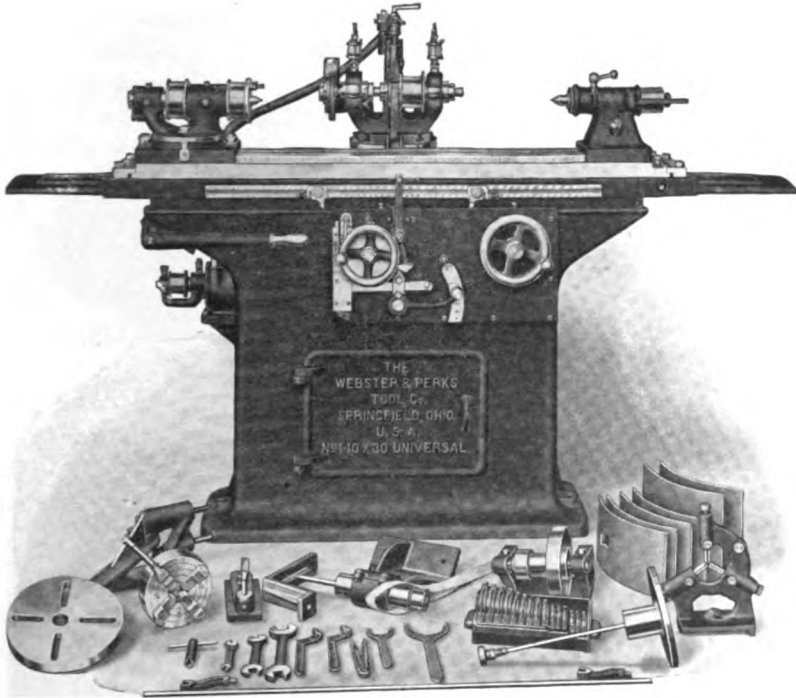
Will Surface Grind

- No. 1 15" long 8" wide $5\frac{1}{2}$ " high
- No. 2 20" long 9" wide $7\frac{1}{2}$ " high
- No. $2\frac{1}{2}$ 25" long 9" wide $7\frac{1}{2}$ " high

THE WEBSTER & PERKS TOOL CO.

300 CENTER ST., SPRINGFIELD, OHIO, U. S. A.

Manufacturers of Pointing, Threading and Special Tapping Machinery, Universal Cylindrical Grinding Machines, Ball and Plain Bearing Grinding and Polishing Machinery



365

WEBSTER & PERKS HEAVY DUTY UNIVERSAL CYLINDRICAL GRINDER

Rigid Construction, with Best of Materials and Workmanship, Insures Accuracy of this No. 1 (10' x 30') Universal Cylindrical Grinder.

Accuracy guaranteed to compare with any similar machine made by any manufacturer.

Has many exceptional features not found on other machines of this type. Internal grinding attachment and counter-bracket as well as dead center pulley are Ball Bearing—countershaft is Hyatt Roller Bearing throughout.

Automatic Cross Feed is simple, rigid, accurate and reliable, and adjustable for feeding from .00025" to .004" by simply turning knurled nut.

Fast and slow table speed obtained by shifting quick-change gear lever in front of machine, which with four-step cone pulleys on countershafts give 8 table speeds, from 7 inches to 70 inches per minute.

Many other features and specifications in bulletin.

JOSEPH T. RYERSON & SON

Established 1842

Incorporated 1888

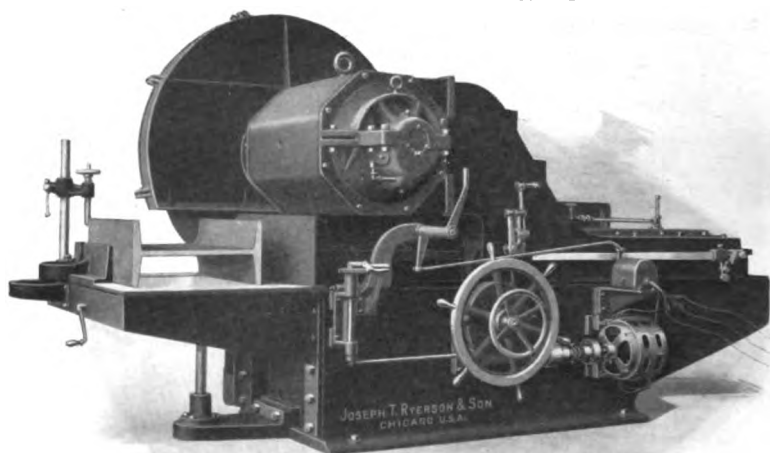
CHICAGO

NEW YORK

ST. LOUIS

DETROIT

HIGH SPEED FRICTION SAWS



366

The leading Mechanical Engineers and Shop Managers acknowledge the many advantages which the High Speed Friction Saw has compared with slow speed cold saws and beam shears. This is evidenced by the installations in many large shops throughout the country.

Uses: The Ryerson High Speed Friction Saw is being used by the leading bridge and structural plants in this country and abroad, by shipbuilding plants in the cutting to length of structural shapes and by frog and switch manufacturers and the railroads are likewise using the saw in reclamation work of old rail sections.

In addition to the above classes of cutting work this saw will cut round and square bars when used with the Ryerson Patented stock chucking and rotating device.

The Machines Are Made in Four Sizes

No. 1 Capacity.....	12" Beam sections
No. 2 Capacity.....	18" Beam sections
No. 3 Capacity.....	up to 24" Beam sections
No. 4 Capacity.....	The heaviest sections

rolled including Bethlehem Sections.

These machines will also cut various other structural shapes, and bars with equivalent cutting area.

Time Saving: The Ryerson High Speed Friction Saw will cut material in a small fraction of the time required in cutting by any other means. The average time for cutting, when all sections are considered, is less than 40 seconds per cut. Rails, Beams, Angles, Channels and Bars, etc., may be cut in immediate succession without any adjustment of the machine.

Power Consumption: Entire absence of belts, gears, fly wheels, etc., permits operation at the highest efficiency and at much less expense than other machines of same capacity.

THE WHITNEY MFG. CO.

HARTFORD, CONN.

Chains—Keys and Cutters—Hand Milling Machines

"WHITNEY" TRANSMISSION CHAINS

The Flexibility of Belts
The Positive Connection of Gears



Silent Type

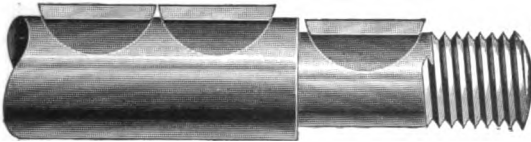
For machine tools, line shafts, factory drives, electric motors, cam shafts, magnetos, lighting systems, generators, pumps, self-starters, etc.



Roller Type

Used by the leading makers of motor trucks and rendering satisfactory service every day in the year.

Our engineering department will be glad to assist you to secure maximum efficiency and service.



"WHITNEY" KEYS AND CUTTERS for the Woodruff System

Used by the leading builders of automobiles and machine tools where strength, economy, and absolute interchangeability are a necessity. Our customers state that sometimes it saves as much as 75% over the old method. The operation of cutting the key seat is simple and rapid, and requires no skilled labor.

THE WHITNEY HAND MILLER

Is invaluable in the **LARGE FACTORY** as no other design equals it for big production on interchangeable work, as proved by the thousands of these machines in constant use both here and abroad. One concern alone is using over 700 of these machines and many other concerns have over one hundred each.

Is invaluable in the **SMALL SHOP** as it will handle a wide variety of operations with convenience, accuracy and rapidity. Soon pays for itself.



NOBLE & WESTBROOK MFG. CO.

HARTFORD, CONN., U. S. A.

Manufacturers of Dwight Slate Marking Machines, Marking Devices of Every Description, Expert Die Cutting and Engraving, Filing Machines, Grinding and Polishing Machines



**Hand or Power
Machines Recommended**

DWIGHT SLATE MARKING MACHINE

These Machines Will Mark Artistically Any Article or Any Material Suitable for Impressions

A specialty of our line of manufacture is the making of devices and machines for placing on flat or round metal surfaces, impressions of trade-marks, patent dates, graduated scales and a variety of similar work. These machines are not expensive, are adapted to the work, do it in a superior manner at less cost than is possible on any makeshift devices.

A neat mark is desirable, adds to appearance of goods, and is a feature that the manufacturer cannot afford to ignore. Goods of all kinds are put on the market in more tasty and improved form than a few years since.

Both trade and purchasers call for these qualities. Antiquated and clumsy designs that were "good enough" are rapidly being displaced by improved forms and finish. By using modern machinery this is done at saving of original cost; therefore, when we offer better work at less cost we ask its consideration. Samples or sketches of work are solicited, proper machines recommended, and complete outfits furnished.

DIE CUTTING BY EXPERT ENGRAVERS

For These Machines a Specialty

We have a large force of expert engravers familiar with the die cutting for these machines and in order to get the best results, we would recommend that you send us samples and let us furnish you the first equipment of dies and fixtures.

GRINDING AND POLISHING MACHINES

The new Noble & Westbrook Automatic Surface Grinder, furnished with or without magnetic chuck, is dust-proof, has feed dials graduated to .001", and has a capacity of 8" x 20". All slides and spindles are adjustable for wear.

Catalog gives complete details.



Automatic Surface Grinder

KELLER MECHANICAL ENGRAVING CO.

68 WASHINGTON ST., BROOKLYN BORO, NEW YORK CITY, U. S. A.

Die Cutting Machinery and Dies

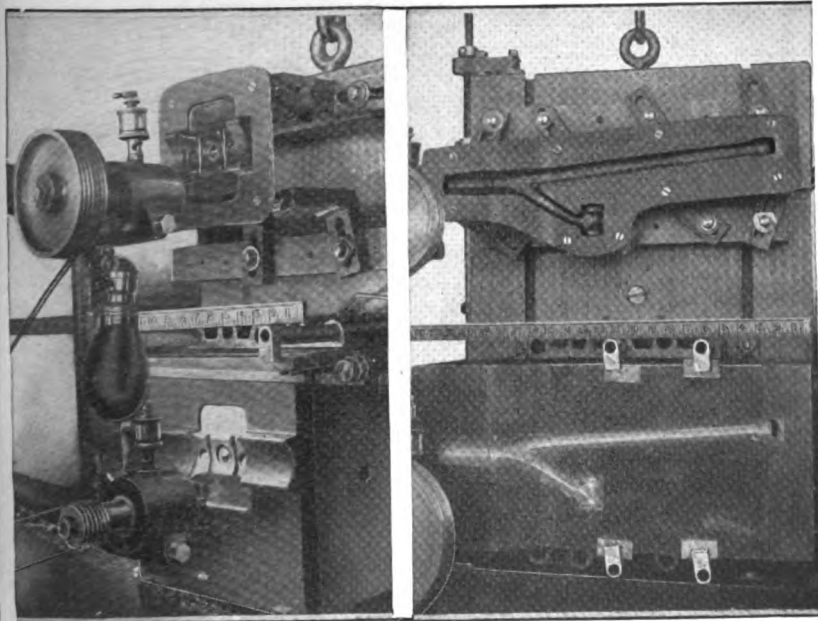
AUTOMATIC DIE SINKING MACHINES

With the constantly increasing demand for dies and moulds the supply of skilled labor has become entirely inadequate. The Keller Machines have solved this problem for industries requiring FORGING and STAMPING DIES. They are in use in the leading Drop Forge plants in America and Europe. Thousands of Forging Dies for Rifle and Automobile Components, Tools, Railroad and Marine Work, etc., are being turned out by this method. For SHEET METAL EMBOSSING, for GLASS MOULDS, for LETTER CUTTING, COIN AND MEDAL WORK, PAPER EMBOSSING, machines of various types are supplied.

Every engineer should be acquainted with the MODERN METHOD OF DIE CUTTING.

KME
TRADE MARK

369



Spring Seat Die 12" X 12" X 9"

Steering Arm Die 23½" X 11" X 10"

Details of Keller Machines Cutting Dies for Motor Car Parts

THE VAN DORN ELECTRIC TOOL CO.

Electric Tool Specialists

THE VAN DORN AND DUTTON CO.

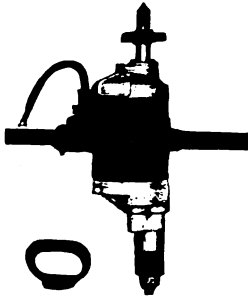
Gear Specialists

GENERAL OFFICES AND FACTORIES

CLEVELAND, O.

The erection of big new factories equipped with the latest machinery gives both Van Dorn companies excellent facilities for supplying the demand for their respective products.

**"Van Dorn" "HARD SERVICE" (PORTABLE) ELECTRIC DRILLS
AND REAMERS**



Made in various speeds for rapid production on bridge, structural and car reaming, general drilling, etc.

110-220 and 250 volt machines carried in stock.

The motors employed are of the straight series type, designed to withstand a 50% overload. Ball bearings are used on both ends of the armature shaft, ball type thrust bearings, hardened and ground gears with accurately generated teeth, quick make-and-break switches, and forced lubrication in lower head.

DIRECT CURRENT MACHINES

Type	CAPACITY STEEL		Weight	E. H. P.
	Drilling	Reaming		
D. C. 1	$\frac{1}{4}$ "	$\frac{1}{16}$ "	22 lbs.	.73
D. C. 2	$\frac{3}{8}$ "	$\frac{1}{8}$ "	28 "	1.32
D. C. 2x	$\frac{3}{8}$ "	"	38 "	1.47
D. C. 3x	1"	"	40 "	2.07
D. C. 3	$1\frac{1}{4}$ "	$1\frac{1}{8}$ "	69 "	2.95
D. C. 4	$1\frac{1}{2}$ "	$1\frac{1}{4}$ "	75 "	2.95
D. C. 5	2"	$1\frac{1}{2}$ "	105 "	4.43

Supplied with cable ready to attach to line. $\frac{1}{2}$ " machines supplied with chucks when wanted. $\frac{3}{8}$ " machines and larger supplied with Morse taper sockets.

We also carry in stock universal machines for operation on D. C. and A. C. in $\frac{3}{16}$ ", $\frac{1}{4}$ ", $\frac{5}{16}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{11}{16}$ ", $\frac{7}{8}$ ", and 1" capacities.

**"Van Dorn" GEARS AND
GEAR CUTTING**

The Van Dorn & Dutton Co. specialize in gearing, and are prepared to furnish complete, machine complete, or cut only—to your specification—gears of all descriptions, for every class of service.

Our output includes spurs, bevels, spiral bevels, mitres, spirals, worms, racks, sprockets, rawhide pinions, etc.

An enlarged hardening and steel-treating plant is one of the features behind "Van Dorn" quality.



WISCONSIN ELECTRIC COMPANY

RACINE, WIS., U. S. A.

CABLE ADDRESS—DUMORE, RACINE

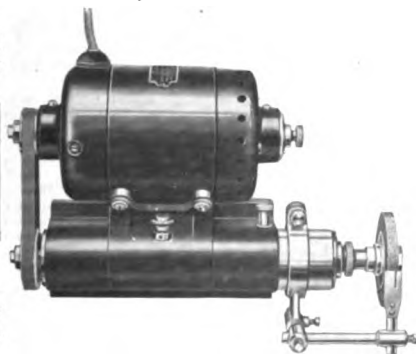


DUMORE Grinder Equipment A

Various speeds, reaching a maximum of 50,000 R. P. M. are obtained on ball bearing

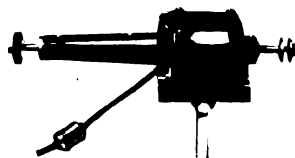


mounted spindles. These high speeds insure freedom from taper and bell mouth. Motors are universal and operate on both direct and alternating currents.



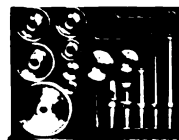
DUMORE No. 3 Multi-Speed Grinder

Correct cutting speeds for all wheels and dynamic or perfect running balance of revolving parts guarantee extreme accuracy through the use of DUMORE grinders. These tools are ideal for grinding dies, reamers, gauges, etc., and very easily handle difficult jobs.



DUMORE Grinder Equipment B

The dynamic or perfect running balance of every mature eliminate vibration. Th



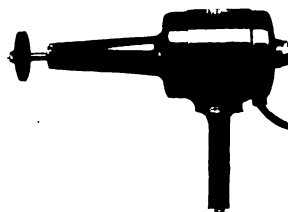
DUMORE Grind is portable, easily carried and is found most useful from one part of the shop to the other.

Mechanical Engineers throughout the world use and highly endorse DUMORE grinders. Write for literature and prices on the fastest portable electric grinder made.

When ordering, be sure to state your voltage.



DUMORE Grinder Equipment C



DUMORE Junior Grinder

DUMORE HIGH SPEED GRINDERS

LANDIS MACHINE CO., INC.

WAYNESBORO, PA., U. S. A.

Manufacturers of Bolt Threading, Bolt Pointing, Nut Tapping, Pipe and Nipple Threading and Pipe Threading and Cutting Machines; Screw Cutting Die Heads and Chaser Grinder

THE LANDIS CHASER

The design of the Landis chaser is entirely different from any other type of die and it embodies features which insure a high production of clean-cut, well-formed threads at a minimum cost of die maintenance.

Distinctive Features of the Landis Chaser: Its length is such as to give a life many times that of any other die. It has a variable rake angle which permits of a grinding suitable for the material being threaded. It has a line contact with the stock, thereby reducing the friction to a minimum and permitting of exceptionally high cutting speeds. The throat or bevel is permanent insuring close shoulder work at all times. The chasers are interchangeable to the extent that any one or more of a set can be replaced without renewing the entire die. The chaser is milled and hardened its entire length, eliminating the necessity of annealing hobbing and retempering. The chaser is sharpened by merely grinding it at the end. High speed steel can be used to better advantage than in any other type of die.



THE LANDIS DIE HEAD

The die head is made entirely of steel. It has a diametrical adjusting mechanism which permits of a universal adjustment. The head is provided with an automatic opening and closing device which derives its action from the forward and backward travels of the carriage. This device is located within the head and carries all the cutting strain. It also serves to lock the head relieving the yoke of this duty. The head is graduated both right and left hand for all sizes within its range.

THE LANDIS BOLT THREADING MACHINE

The Landis Bolt Threading Machine is designed to give economical service and accurate results. The frame is cast in one piece. An excellent die lubricating system insures a sufficient flow of lubricant at all times. The carriage is gibbed to the bed to compensate for any wear. The vises have a horizontal sidewise as well as a vertical centering adjustment permitting a perfect and permanent alignment with the die. All gears are enclosed to provide for the safety of the operation.

THE LANDIS PIPE AND NIPPLE THREADING MACHINE

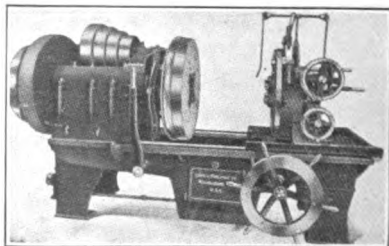
The Landis Pipe and Nipple Threading Machine is similar in design to the Bolt Threading Machine. It is equipped with a reaming device which removes the burr which forms during the cutting-off operation, while the pipe is being threaded. Nipple grips are provided with both plain and threaded surfaces to receive the blank and threaded pipe ends.

THE LANDIS PIPE THREADING AND CUTTING MACHINE

The Landis Pipe Threading and Cutting Machine employs a stationary type die head. The entire range of each head with the exception of the 2" size is covered by but one set of chasers. The head is manually operated and under working conditions is locked within itself.

The machine is rigid in construction and its design embodies all features to facilitate production and to insure safety for the operator. The carriage supports the head, cutting-off tools, reaming device and length gauge, all located conveniently for efficient service.

Catalogue No. 22—Bolt Threading Machinery.



Catalogue No. 23—Pipe Threading Machinery.

LANDIS MACHINE CO., INC.

SPECIFICATIONS OF STANDARD BOLT THREADING MACHINES

Type	Size	Range	Chaser Equipment Inches	R. P. M. Countershaft		Floor Space Required	Approx. Net Weight Lbs.
				Carbon Steel	H. S. Steel		
Single Head Machines	$\frac{1}{2}$ "	$\frac{1}{8}$ " to $\frac{1}{2}$ "	1 set each of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, and $\frac{5}{8}$.	180	300	1' 9"x4' 1"	850
	1"	$\frac{1}{4}$ " to 1"	1 set each of $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, & 1"	200	300	2' 3"x4' 11 $\frac{1}{2}$ "	1350
	$1\frac{1}{4}$ "	$\frac{3}{8}$ " to $1\frac{1}{4}$ "	1 set each of $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, and $1\frac{1}{4}$.	300	450	2' 3"x4' 11 $\frac{1}{2}$ "	1400
	$1\frac{1}{2}$ "	$\frac{1}{2}$ " to $1\frac{1}{2}$ "	1 set each of $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, and $1\frac{1}{2}$.	280	400	2' 3"x4' 11 $\frac{1}{2}$ "	1400
	2"	$\frac{1}{2}$ " to 2"	1 set each of $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{3}{4}$, and 2".	225	400	2' 8"x7' $1\frac{1}{2}$ "	2200
	$2\frac{1}{2}$ "	$\frac{3}{4}$ " to $2\frac{1}{2}$ "	1 set of $\frac{3}{4}$, $\frac{1}{2}$, 1, $1\frac{1}{4}$, $1\frac{1}{8}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, 2, $2\frac{1}{4}$, and $2\frac{3}{4}$.	300	500	2' 8"x7' $1\frac{1}{2}$ "	2300
	$2\frac{1}{2}$ "	$\frac{3}{4}$ " to $2\frac{1}{2}$ "	1 set each of $\frac{3}{4}$, $\frac{1}{2}$, 1, $1\frac{1}{4}$, $1\frac{1}{8}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, 2, $2\frac{1}{4}$, and $2\frac{3}{4}$.	300	500	2' 11"x8' $3\frac{1}{2}$ "	3000
	Long Bed	1" to 3"	1 set each of 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, 2, $2\frac{1}{4}$, $2\frac{3}{4}$, and 3".	300	500	3' 7"x9' 1"	4200
	3"	1" to $3\frac{1}{2}$ "	1 set each of 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, 2, $2\frac{1}{4}$, $2\frac{3}{4}$, $3\frac{1}{4}$, and $3\frac{1}{2}$.	300	500	3' 7"x9' 1"	4400
	4"	$1\frac{1}{2}$ " to 4"	1 set each of $1\frac{1}{2}$, $1\frac{3}{4}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, 2, $2\frac{1}{4}$, $2\frac{3}{4}$, $2\frac{5}{8}$, $3\frac{1}{4}$, $3\frac{3}{4}$, and 4".	300	500	3' 7"x9' 1"	4550
Double Head Machines	$\frac{1}{2}$ "	$\frac{1}{8}$ " to $\frac{1}{2}$ "	2 sets each of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, and $\frac{5}{8}$.	180	300	2' 10 $\frac{1}{2}$ "x4' 1"	1400
	1"	$\frac{1}{4}$ " to 1"	2 sets each of $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, and $\frac{3}{4}$, and 1 set each of $\frac{7}{8}$, and 1".	200	300	3' 6"x4' 11 $\frac{1}{2}$ "	2250
	$1\frac{1}{4}$ "	$\frac{3}{8}$ " to $1\frac{1}{4}$ "	2 sets each of $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, and $\frac{7}{8}$, and 1 set each of 1, $1\frac{1}{8}$, and $1\frac{1}{4}$.	300	425	3' 6"x4' 11 $\frac{1}{2}$ "	2350
	$1\frac{1}{2}$ "	$\frac{1}{2}$ " to $1\frac{1}{2}$ "	2 sets each of $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, and 1, and 1 set each of 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, and $1\frac{1}{2}$.	280	400	3' 6"x4' 11 $\frac{1}{2}$ "	2400
	2"	$\frac{1}{2}$ " to 2"	2 sets each of $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, and $1\frac{1}{2}$, and 1 set each of $1\frac{3}{4}$ & 2".	225	400	4' $\frac{1}{2}$ "x6' $4\frac{1}{2}$ "	3800
	$2\frac{1}{2}$ "	$\frac{3}{4}$ " to $2\frac{1}{2}$ "	2 sets each of $\frac{3}{4}$, $\frac{1}{2}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, 2, and 1 set each of 2 $\frac{1}{4}$ and 2 $\frac{3}{4}$.	300	500	4' $\frac{1}{2}$ "x7' $1\frac{1}{2}$ "	4050
	3"	1" to 3"	2 sets each of 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, and 2" and 1 set each 2 $\frac{1}{4}$, 2 $\frac{3}{4}$, 2 $\frac{5}{8}$ and 3".	300	500	9' 1"x7' 0"	7800
Triple Head Machines	1"	$\frac{1}{8}$ " to 1"	1 set each of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and 1"	400	550	5' $4\frac{1}{2}$ "x4' 11 $\frac{1}{2}$ "	3350
	$1\frac{1}{2}$ "	$\frac{1}{2}$ " to $1\frac{1}{2}$ "	1 set each of $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$ and $1\frac{1}{2}$.	250	360	5' $4\frac{1}{2}$ "x4' 11 $\frac{1}{2}$ "	3650
	2"	$\frac{1}{2}$ " to 2"	1 set each of $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{3}{4}$, and 2".	500	700	6' $1\frac{1}{2}$ "x8' 1"	5400
Staybolt Machines							
Sin. Head	$1\frac{1}{2}$ "	$\frac{1}{2}$ " to $1\frac{1}{2}$ "	As desired	225	360	2' 3"x7' 3"	1450
Don. Head	$1\frac{1}{2}$ "	$\frac{1}{2}$ " to $1\frac{1}{2}$ "	As desired	225	360	3' $6\frac{1}{2}$ "x7' 3"	2650

373

SPECIFICATIONS OF STANDARD PIPE AND NIPPLE MACHINES

Type	Size	Range	Chaser Equipment (carbon steel)	R. P. M. Countershaft		Floor Space Required	Approx. Net Weight Lbs.
				Carbon Steel	H. S. Steel		
Sin. Head Mach.	$\frac{1}{2}$ "	$\frac{1}{8}$ " to $\frac{1}{2}$ "	1 set each 27, 18 and 14 Pitch.	180	400	1' 9"x4' 6"	850
	$1\frac{1}{4}$ "	$\frac{1}{8}$ " to $1\frac{1}{4}$ "	1 set each 27, 18, 14, and $11\frac{1}{2}$ Pitch.	300	425	2' 3"x5' 1"	1200
	2"	$\frac{1}{2}$ " to 2"	1 set each 18, 14 and $11\frac{1}{2}$ Pitch.	225	400	2' 8"x7' 8"	2400
	4"	$2\frac{1}{2}$ " to 4"	1 set 8 Pitch.	300	500	9' 11"x3' 7"	4650
Don. Head Mach.	$\frac{1}{2}$ "	$\frac{1}{8}$ " to $\frac{1}{2}$ "	2 sets each 27, 18 and 14 Pitch.	180	300	2' 10 $\frac{1}{2}$ "x4' 6"	1400
	$1\frac{1}{4}$ "	$\frac{1}{8}$ " to $1\frac{1}{4}$ "	2 sets each 27, 18, 14 and $11\frac{1}{2}$ Pitch.	300	425	3' 6"x5' 1"	2300
	2"	$\frac{1}{2}$ " to 2"	2 sets each 18, 14 and $11\frac{1}{2}$ Pitch.	225	400	4' 0"x6' 1"	3800
	4"	$2\frac{1}{2}$ " to 4"	1 set 8 Pitch.	350	550	8' 1"x6' 10 $\frac{1}{2}$ "	7850

SPECIFICATIONS OF STANDARD PIPE THREADING AND CUTTING MACHINES

2"	$\frac{1}{2}$ " to 2"	1 set each 14 and $11\frac{1}{2}$ Pitch.	225	400	6' 8"x3' 2"	2650
4"	1" to 4"	1 set each $11\frac{1}{2}$ and 8 Pitch.	300	500	9' 10"x4' 4"	6600
6"	$2\frac{1}{4}$ " to 6"	1 set 8 Pitch.	275	450	9' 10"x4' 4"	5600
8"	$2\frac{1}{2}$ " to 8"	1 set each 8 Pitch and 8 Pitch.	225	400	9' 10"x4' 0"	10000

GREENFIELD TAP & DIE CORP'N

GREENFIELD, MASSACHUSETTS

Manufacturers of Screw Cutting Tools and Machinery, Gages and Reamers

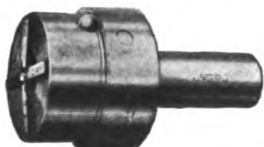
STORES AT

NEW YORK, 28 Warren Street
Canadian Factory, Wells Brothers Co.,

CHICAGO, 13 South Clinton Street
of Canada, Ltd., Galt, Ontario



Acorn Die and Holder



Wells Self-Opening Die



"Gun"
Tap



Solid
Reamer



Our line of Tools and Machinery covers a broad field. We are essentially makers of Screw Cutting and Measuring Tools. The line, however, includes other Tools and Machines that are closely allied.

A fairly comprehensive list follows. We want to supply you with catalogs and booklets. Please state what you are particularly interested in.

SCREW CUTTING TOOLS

Taps—for every purpose from watch-making to bridge-building, including the shear cutting "Gun" Tap.

Dies—Wells Self-Opening Die, Acorn Die and Holders and a variety of Adjustable Dies for hand and machine use.

Screw Plates—More than one hundred different assortments of Taps and Dies to meet every possible requirement.

GAGES

Screw Thread—Plug and Templet, Limit Snap Gages, Screw Pitch Gages, etc., made for all threads, forms and pitches.

Cylindrical—Plug and Templet and Adjustable Limit Snap Gages in all sizes.

Special—We design and manufacture Special Gages of any type and outline complete gaging systems for any product.

REAMERS

Spiral Fluted—Reamers of this type give a shearing cut, and they will not chatter or "hog" in. A complete line of straight fluted reamers of all types.

PIPE TOOLS

Stocks and Dies—"Trio" and "Duo" combinations always ready for work, Stocks with O. K. Forged Dies, "Economy" Stocks and Dies and Armstrong Type of Adjustable Dies. Also complete tool sets.

Wrenches, Cutters and Vises—A line of pipe tools that has always been popular.



Cylindrical Limit Snap Gage



GREENFIELD TAP & DIE CORP'N

GTD MACHINE TOOLS

Threading Machines

We make a complete line of threading machines from the little, hand bench outfits to the large power machines with automatic opening die heads.

The machines are geared high as well as having an exceptionally rapid adjusting mechanism and because of these features they are equally good for threading both large lots and on job work.

Tool and Cutter Grinders

"Wells" Tool and Cutter Grinders are made in both the Plain and Universal types. The Plain Grinder for either bench or floor use will handle any work which may be ground on the periphery of the wheel. In the Universal Grinder the table is provided with both vertical and radial adjustments so that all classes of work may be ground.

Lathes

The "Wells" line of lathes has been marketed for several years by F. E. Wells & Son Co. Division. It includes Speed Lathes, Manufacturers' Lathes and Manual Training Lathes. Any of these may be had with individual motor drive at the purchaser's option. The Manual Training Lathes are also furnished with a shaft underdrive which embodies a four-speed changing device.

Hand Screw Machines

"Wells" Hand Screw Machines will handle stock up to 1" diameter. They are provided with wire feed, four- or six-hole turrets and positive lubrication.

The six-hole turret indexes automatically and its under side forms a cam which regulates the stops. It is impossible for this turret to overrun a stop so that it may be operated by unskilled labor without danger to machine or work.

Cutting-Off Machine

Nutter and Barnes High Power Cutting-Off Machines (capacity from 0 to 12" dia.) meet every modern metal cutting requirement—accuracy, speed, ease of operation and dependability. Developed to top notch efficiency, they have greater capacity, size of saw considered, than any similar machine on the market.

Extra powerful drive, single lever control for starting and stopping feed and forced lubrication are some of the important features.

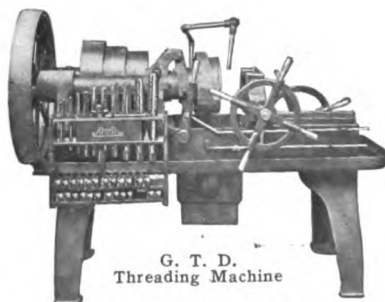
Saw and Cutter Sharpeners

For sharpening either plain saws or saws with B & S patent relieved teeth, the Nutter and Barnes saw sharpener is recommended. The automatic sharpeners work with the precision of a well-timed clock.

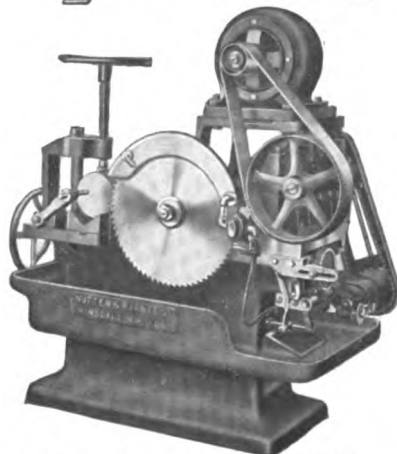
The teeth are spaced evenly and radially from an index plate which is cut accurately with the same number of teeth as the tool—not from the tool itself. The various models have a capacity of from 2½" to 36" saws and will handle cutters from 2½" diameter up.



"Wells" Universal Grinder



G. T. D.
Threading Machine



Nutter & Barnes Cutting-Off Machine

MEHL MACHINE TOOL & DIE CO.

OFFICE AND WORKS
ROSELLE, NEW JERSEY
AT LORRAINE STATION

Designers and Builders of Semi and Automatic Machines, Special Machinery,
Tools and Dies, Sub-Press Dies



Exterior and Interior Views of the Mehl Plant

TRADE MARK
MADE IN U.S.A.

JIGS, FIXTURES, DIES, GAGES, SPECIAL MACHINERY, WOOD AND METAL PATTERNS

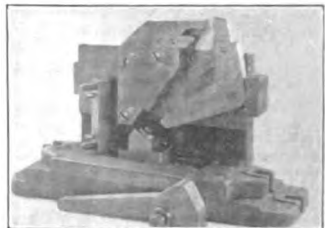
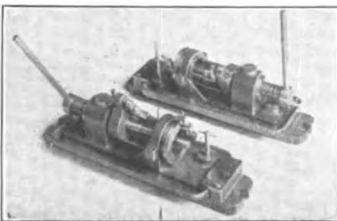
now have a new home—a home worthy of the products themselves.

We are pardonably proud of this new home, of its modern construction, of the equipment and conveniences it contains.

We feel its accessibility to New York City is an advantage that will make for appreciable time-saving.

We have chosen our workmen with the greatest care—each is an expert in his line.

These advantages, combined with long experience in the making of better tools, are reasons why you will be serving your best interests by sending us your next order. We are sure you will be perfectly satisfied with both the price and quality of our work.



Accurate Milling Fixtures

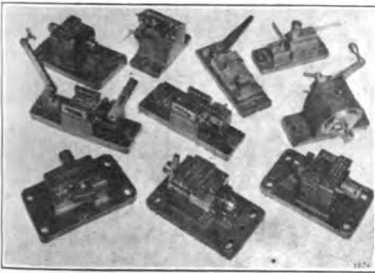
MEHL MACHINE TOOL & DIE CO.

The purpose back of our organization is to assist you in *your* manufacturing, through the making of accurate jigs, fixtures, dies and tools.

TRADE MARK
MEHL

Our shop contains a complete equipment of the best high-grade precision tools, manned by a corps of experts. Our engineers are ready to design your special work, whatever its nature.

Our past experience covers a broad field, including all requirements as illustrated in the various groups below.



Milling and Indexing Fixtures



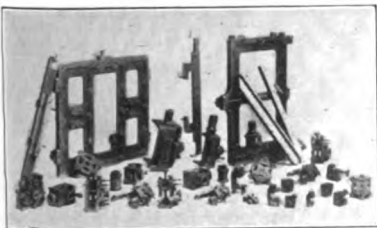
Complicated Dies



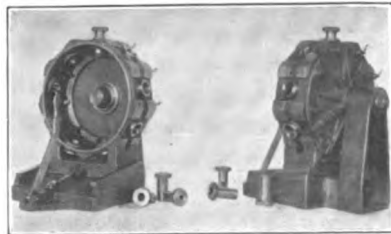
Drill Jigs and Fixtures



Variety of Gages



Variety of Small and Large Jigs



Large Indexing Drill Jig

THE CLEVELAND TWIST DRILL CO.

NEW YORK CITY
30 Reade Street

Established 1874
CLEVELAND, OHIO

CHICAGO
9 No. Jefferson St.

Catalog No. 319 Describes All "Cleveland"

DRILLS REAMERS
COUNTERBORES
SCREW EXTRACTORS



Trade Mark

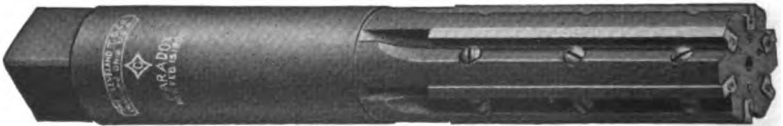
SOCKETS MILLS
MANDRELS ARBORS
HIGH SPEED TOOLS



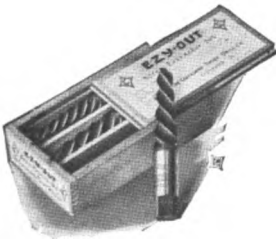
"Paragon" Drills are not flat bars twisted while hot, but are twist drills *forged* from the original bar of high speed steel in special dies. This method produces correctly shaped flutes and toughens the metal. "Paragon" Drills hold the world's drilling record—57½ inches penetration per minute through cast iron. They may be adapted to Morse standard tapers by means of special sleeves.



"Peerless" High Speed Reamers (patented) have blades of high-speed steel united with the soft steel body by a patented process which produces a solid, one-piece reamer of unusual toughness, at an appreciable saving in manufacturing cost. "Peerless" High Speed Reamers are especially recommended for machine reaming and are furnished in all styles, *including expansion*.



"Paradox" Reamers (patented) combine many of the advantages of both solid and adjustable types. The body is of machinery steel, case-hardened where subject to wear, into which are inserted blades of tool steel. Taper-headed screws wedge these blades firmly against their backing, the blades being counter-sunk at intervals along the shoulder at their base to fit the taper screw-heads.



EZY-OUT Screw Extractors (patented). The only tool designed for the express purpose of removing broken set and cap screws, studs and pipe-fittings. Made in 12 sizes. A valuable adjunct to every shop.

One of the screws is placed near the end of the blade, giving firm support where most needed, and preventing the tool from "hogging in." This construction gives all the rigidity of a solid reamer.



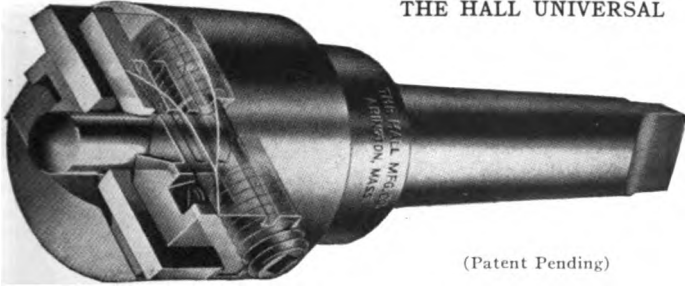
"Perfect Double Tang" Sockets (patented) have two driving slots instead of the usual one and afford a simple means of restoring old tools with broken tangs to their original usefulness. They will fit any spindle or socket having a regular taper hole.

THE HALL MANUFACTURING CO.

ABINGTON, MASS., U. S. A.

Manufacturers of Hall Universal Counterbore, and Special Machinery

THE HALL UNIVERSAL



(Patent Pending)

COUNTERBORE, END-MILL, HOLLOW-MILL OR BORING TOOL

Instead of buying a whole set of solid tools to counterbore various sizes, why not get this one adjustable universal tool that will do what a whole set of solid tools does? Can be used at just as good advantage for end milling, hollow milling, spot facing, counter sinking for machine screw heads, etc.

The illustration shows just how this tool is made. The two interchangeable cutter blades, which are sharpened on four edges, are held solidly in the jaws and adjusted by the right and left hand screw.

These tools are made in various sizes and each size has a wide range of adjustment. For instance—the No. 2 Tool with one set of cutter blades and different sized pilots (the pilot is shown between the blades) will do from $\frac{1}{8}$ inch to $2\frac{1}{2}$ inch diameter. You can also use a drill in place of the pilot and drill and counterbore at one operation. The pilot is held by interlocking jaws, same as in a regular drill chuck. Think of the difference in cost between one set of cutter blades and a set of solid tools.

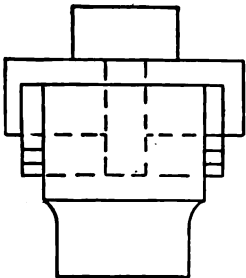
Hall Adjustable Universal Tools can also be used to great advantage on AUTOMATICS.

Try them in your shop—see what perfect work they do, and how much they save in high speed tool cost. Any shape cutter can be used. Parts are made interchangeable. Material and workmanship guaranteed first class in every respect.

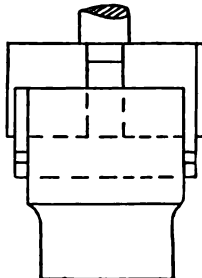
Price includes a set of pilots from $\frac{1}{4}$ inch to $\frac{3}{4}$ inch by $\frac{1}{16}$ and set of high speed cutters.

Size of cutter furnished with No. 2 Tool is $\frac{1}{8}$ x $\frac{3}{4}$ x $\frac{7}{8}$.

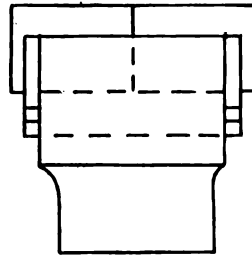
Showing some of the numerous operations this Universal Tool can be used for.



Large Hole with Shouldered Pilot



hollow Milling



Spot Facing

THE McCROSKEY REAMER CO.

MEADVILLE, PA.

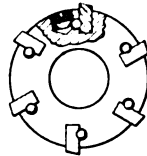
Manufacturers of Adjustable Reamers, Turret Tool Posts, Wizard Quick-Change Chucks and Collets, Wizard Variable Speed and Reversing Attachment for drill press, Searchlight Universal Lamp Brackets for shop and drafting room, Tap and Die Holders for Turret Lathes, and Other Cost-Cutting Specialties



Fig. 18



Fig. 24



SUPER ADJUSTABLE REAMERS

If you are in any way personally responsible for reaming results in your shop, you should familiarize yourself with this line of reamers. All styles and sizes from $\frac{3}{4}$ " to 10". High speed or carbon. Unequaled in design, unexcelled in workmanship and material, combining all the advantages of both solid and adjustable reamers without the disadvantages of either.

Hundreds of the largest and best shops have adopted these reamers as standard equipment. We solicit the privilege of figuring on your requirements.



Fig. 21

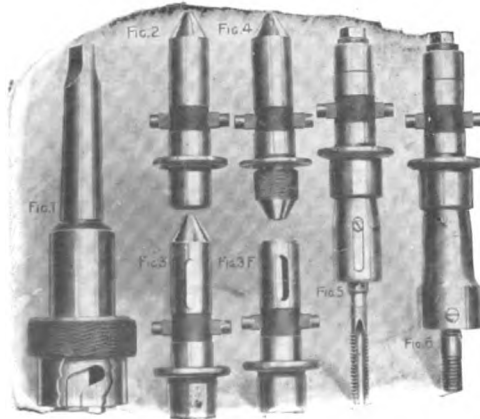
WIZARD QUICK-CHANGE CHUCKS AND COLLETS

will revolutionize any drill press job where it is desired to use more than one tool in succession. Takes all sizes and kinds of tools, such as drills, taps, reamers, special tools, etc., in rapid succession without stopping the machine. On many

jobs will show 50% saving. Embodies several important features not found in any similar device. Wizard friction drive collets are unequaled for tapping and stud setting. Wizard No-Need-a-Tang collets reclaim broken tang drills and forever end all tang troubles.

Try a Wizard outfit on thirty days' approval and watch it make dollars for you. We take the risk.

Our complete catalog of cost-cutting tools sent on request.



McCroskey
COST CUTTING TOOLS

THE McCROSKEY REAMER CO.

McCROSKY TURRET TOOL POSTS FOR LATHES

We have developed a complete line of Turret Attachments for engine lathes that will meet the most exacting requirements. McCROSKY Turrets will give you turret lathe advantages with only a nominal investment. The efficiency of almost any lathe can thus be greatly increased.

McCROSKY Turrets are made to fit the lathe in three different ways; either bolted to the bolt circle of compound rest; or attached directly to the cross slide, making a regular carriage Turret; or secured to T slot on top of compound rest like regular Tool Post.

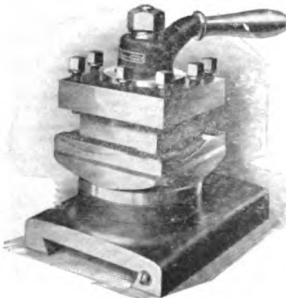
These Turrets are made in various styles to suit practically all conditions and in sizes for all lathes from 12" to 24".

Construction remarkably simple. Indexing feature unequalled for accuracy, rigidity and simplicity. Workmanship and material backed by the McCrosky guarantee.

Catalog on request.



Style F Turret.



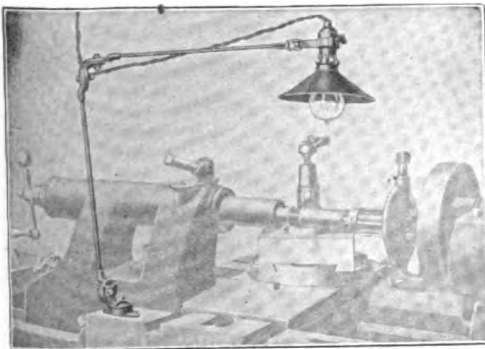
Style K Turret



Style J Turret

381

THE SEARCHLIGHT LAMP BRACKET



Completely universal. Made in various styles to suit all factory and shop conditions. Puts the light where you want it when you want it. More output, better work, happier men. Saves globes.

Inexpensive, easy to install, and will soon pay for themselves several times over.

McCrosky
COST CUTTING TOOLS

MANUFACTURERS EQUIPMENT CO.

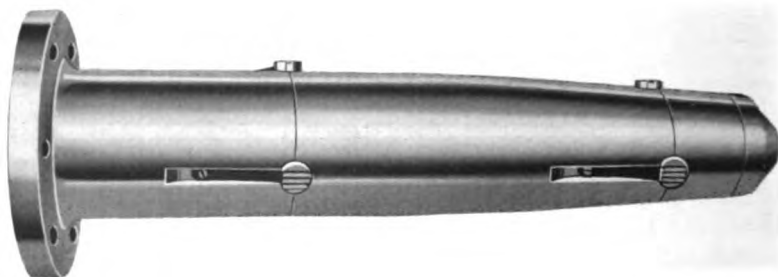
WALLER & FILLMORE STS., CHICAGO, ILL.
Manufacturers of Aerochucks—The Collapsible Tap and
Special Tools for Brass and Iron

M. E. C. AIR CHUCKS
Effect

REMARKABLE PRODUCTION INCREASES

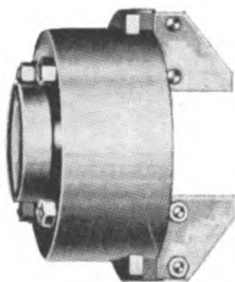


M. E. C. Air Operated Hinge Collet Chuck



M. E. C. Air Operated Compensating Expanding Mandrel

Write for full particulars



**Air Operated
M. E. C. Two-Jaw
Universal Chuck**

**INSTANTANEOUS
IN ACTION**

**POSITIVE
GRIPPING POWER**



**Air Operated
M. E. C. Three-Jaw
Universal Chuck**

THE NATIONAL TOOL CO.

CLEVELAND, OHIO

Manufacturers of Milling Cutters and Special Tools, and The National-Cleveland Adjustable Cylinder Reamer for the Proper Finishing of Engine, or Similar Cylinders without Grinding



Angular Cutters

Double
For Spiral Mills
Arbors—
For Shell End Mills
Milling Machine Screw
Collets—B. & S. Taper
Concave Cutters with Form
Teeth
Concave Cutters—Interlock-
ing
Corner Rounding Cutters
Convex Cutters with Formed
Teeth
Convex Cutters with Milling
Cutter Teeth
Counterbores
Cutters for Making Twist
Drills

Cutters for Grooving Straight

Lipped Twist Drills
Cutters for Making Four
Lipped Twist Drills
Cutters for Fluting Reamers
Cutters for Grooving Taps
Cutters for Grooving Taps
and Reamers
End Mills—
Keyway
With Center Cut
Shell
Straight Shank
Gear Cutters—Involute
Bevel or Mitre
Metric
Hobs—
Spur or Spiral Gear
Worm Wheel

Hollow Mills—

Adjustable
Solid
Inserted Tooth Cutters—
Face Milling Cutters
with Threaded Holes
Side Milling Cutters
Keyway Cutters—Woodruff
Metal Slitting Saws
Milling Cutters—
Nicked Tooth
Plain Milling
Side Milling
Interlocking Side Mill-
ing
Sprocket Cutters—
For Block Center Chains
For Roller Chains
Stocking Cutters
Tee Slot Cutters

Gear Hobs are furnished
14½° Pressure Angle un-
less otherwise specified.

When ordering kindly state
the following:

Pitch
Outside Diameter
Length of Hob

Diameter of Hole and Keyway
Single or Multiple Thread
Right or Left Hand

We are also prepared to fur-
nish Hobs for cutting
Silent Chain Sprockets
and Spline Shafts.

Worm Wheel Hobs are fur-
nished with 14½° Pressure
Angle unless otherwise
specified.

When ordering Worm Wheel
Hobs kindly state the fol-
lowing:

Pitch—Circular or Di-
ametral

Pitch Diameter of Worm
Length of Hob wanted
or Diameter of Worm
Wheel

Diameter of Hole and Key-
way

Single or Multiple
Thread

Right or Left Hand

If Taper Shank is neces-
sary specify kind
wanted

THE NATIONAL PATENT INTERCHANGEABLE COUNTERBORE



All Parts are Interchangeable

Holders are made of the very best material.

Cutters of High Speed Steel.

Pilots of Tool Steel hardened and ground.

The hole for the Pilot in both the Cutter and Holder is ground to insure a good fit for the Pilot Shank. The Pilot is held in place by a Set Screw. The Cutter is screwed on the Holder and it need not depend upon the Pilot for drive.

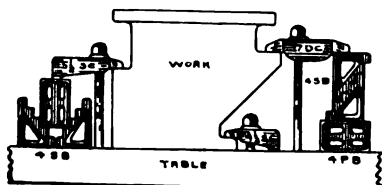
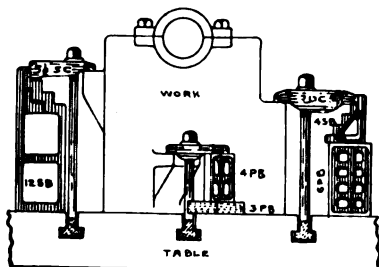
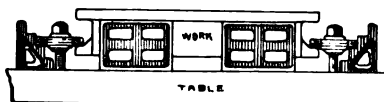
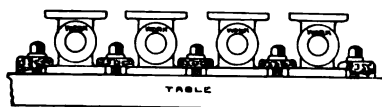
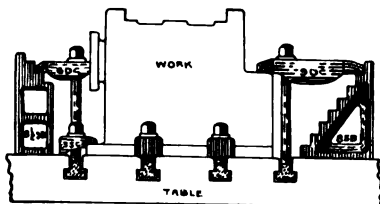
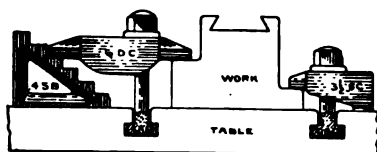
This construction takes all of the extra strain off the Pilot.

Spiral Flutes are milled in Cutter, which gives a sheering cut, and these Flutes extend back so that the Cutter can be used until two-thirds of its length has been ground away. This feature gives a long life to the Cutters.

STANDARD SHOP EQUIPMENT CO.

1413 SOMERSET STREET,
PHILADELPHIA, PENNA., U. S. A.
Manufacturers of Set-up Appliances for Machine Tools

PRACTICAL APPLICATIONS OF CAD CLAMPS, BOLTS, ET



Will not
break out
machine
table
slots

CAD BOLTS



Cannot
turn in
machine
table

Pat. June 29, '18

The CAD bolt is a standard machine
table bolt ready-for-use

Price Per Hundred Bolts without Nuts

Adopted November 5, 1904

Length under head	DIAMETER		
	1/2"	3/4"	1"
2 1/2"	\$12.00	\$18.00	\$26.00
3"	13.00	19.00	28.00
3 1/2"	14.00	20.00	30.00
4"	15.00	22.00	32.00
4 1/2"	16.00	23.00	33.00
5"	16.50	24.00	35.00
5 1/2"	17.00	25.00	37.00
6"	18.00	26.00	38.00
7"	20.00	28.00	42.00
8"	21.00	30.00	45.00
9"	22.50	33.00	48.00
10"	24.00	35.00	52.00
12"	27.00	40.00	58.00

A Standard Tool Room and Machine Shop Clamp

Cat. No.	Length	Price
3DC	3"	.20
4DC	4"	.25
6DC	6"	.35
7DC	7"	.45
9DC	9"	.75

CAD DOUBLE END CLAMP



The Handiest Clamp Ever Used in a Shop

Cat. No.	Length	Price
2SC	2"	.20
3SC	3"	.25
3 1/2 SC	3 1/2"	.30
4 1/2 SC	4 1/2"	.35
5 1/2 SC	5 1/2"	.40

CAD SINGLE END CLAMP



A Universal Packing Block for Tool Room, and Machine Shop

Cat. No.	Size	Price
3PB	3 x 2	.20
4PB	4 x 2 1/2	.30
6PB	6 x 3 1/2	.50

CAD PACKING BLOCK



Cad Step Block

Cat. No.	Size	Price
4SB	4x3	.50
6SB	6x4	1.00
8SB	8x6	2.00
8 1/2 SB	8 1/2 x 2 1/2	1.50
12SB	12x4	4.00



Write for Catalog A1

E C. ATKINS & CO., INC.

HOME OFFICE AND FACTORY

INDIANAPOLIS, IND.

CANADIAN FACTORY, Hamilton, Ont.

MACHINE KNIFE FACTORY, Lancaster, N. Y.

Makers of Saws and Tools

Branches carrying complete stocks in all large distributing centers, as follows:

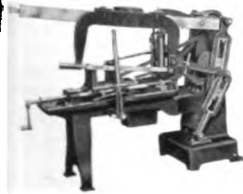
Atlanta
Chicago
Memphis

Minneapolis
New Orleans
New York City

Portland, Ore.
San Francisco
Seattle
Washington, D. C.

Vancouver, B. C.
Sydney, N. S. W.
Paris, France

ATKINS "KWIK-KUT" METAL CUTTING MACHINES



Automatically regulate the stroke, using practically the entire toothed edge of the blade in cutting.

"Kwik-Kut" machines contain many other distinctive Atkins features that reduce expense and increase production. The machine illustrated is furnished either motor- or belt-driven suitable for cutting stock up to 8".

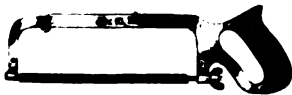
METAL CUTTING SAWS

Atkins Circular Metal Cutting Saws are manufactured from steel specially formulated to withstand the rigors of severe service. Advanced methods of manufacture and an exclusive tempering process afford opportunities to get the best possible blades for Higley, Lea-Simplex, Q & C Bryant, and in fact any machine on the market.



385

HACK SAW FRAMES



Atkins Hack-Saw Frames show character in their construction. Their perfect balance makes them easy to operate and reduces the possibility of blade twists and breaks.

Atkins Frames are made in several different styles suitable for all kinds of work.

ATKINS NON-BREAKABLE HACK-SAW BLADES

Atkins Non-Breakable Hack-Saw Blades are made with the usual hard edge, but with a soft back that prevents breakage.

The edge is tempered so as to insure a cutting capacity equal to "all hard" blades. While these blades will cut equally fast and hold their cutting edge as long as the "all hard" blades, the liability to break or snap off is entirely eliminated. A necessity in out-of-the-way spots or in shop use where inexperienced help is employed.



Makers of all kinds of Saw Tools and Machine Knives.

Description literature sent on request.

HUTHER BROS. SAW MFG. CO.

ROCHESTER, N. Y.

Manufacturers of Patent Inserted Tooth Milling Saws, Hack Saws, Circular and Band Saws for Cutting Wood and Metal, Special Cutters, Discs, Knives and Patent Groovers



HUNTER BROS. PATENT INSERTED TOOTH MILLING SAW

Thin Free Cutting Strong Flexible

Two toughly tempered crucible steel plates firmly riveted together form the body of this saw.

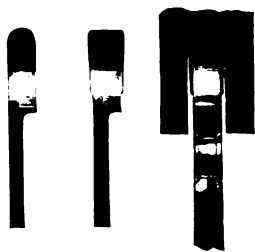
The teeth or inserts are of the finest quality high speed steel and are formed so that grinding or sharpening is done on face of tooth only. This not only insures an easy and quick method of sharpening, but a tooth of great strength and long life as well.

The speed of this saw is recommended at from 35 to 55 peripheral feet per minute, feeding against the stock at the rate of $\frac{1}{2}$ " to 2" and over per minute, according to the nature of the stock and the capacity of the machine.

386

The teeth have large throat room and ample clearance on both sides and back and are guaranteed to be free cutting and to require the minimum amount of power to operate.

The round top tooth is about $\frac{1}{4}$ " higher than the square tooth and acts as a roughing tool, taking the chip from the center. The square tooth following removes the chips from either side of the cut. This breaking up of the chips, together with the double clearance of the square tooth, eliminates the possibility of this saw clogging when cutting soft, stringy stock.



Front View of Teeth
Showing round top and square top teeth in the different heights.



Another View of the Two Teeth
Showing the Rivet Holes and Side and Back Clearance.

List showing thickness or kerf of saws: 14" diam. $\frac{1}{8}$ " thick; 18" diam. $\frac{3}{8}$ " thick; 26" diam. $\frac{1}{4}$ " thick; 30" diam. $\frac{3}{8}$ " thick.

Fine Pitch: We also manufacture this saw with close pitch tooth, $\frac{3}{8}$ " to about $\frac{3}{4}$ " space from point to point. This is not a formed tooth and is not recommended except in cutting small diameter stock, structural steel, rails, etc.

For stock 2" or over, coarse pitch type gives the best results and can be depended upon to give the greater output.

Write for our Catalog

VICTOR SAW WORKS

SPRINGFIELD, MASS.

Manufacturers of Hack Saw Blades

VICTOR HACK SAW BLADES

are made from Victor Special Private Formula Steel, a semi-high speed alloy of extreme toughness. Every blade is carefully milled, not punched, and is scientifically hardened, not surface burnt. The

teeth are set by our Victor patented shear set. Every tooth a perfect cutting tool.

To get 100% efficiency care should be taken in selecting the right blade, and there is a Victor blade for every purpose. This does not mean a confusing number of blades for we have carefully worked out by experiment and test the best blade for each kind of work

• VICTOR



HAND—ALL HARD NO. 1

Size Inches	Regular Stock Blade	TEETH PER INCH—FOR CUTTING				Price per Gross
		Soft Steel Cast Iron	Tool Steel Light Angle Iron	Brass, Copper Drill Rod Iron Pipe Sheet Metals	Thin Tubing Electric Casing Thin Sheet Metals	
8x 1/2 x .025	18	18	18	24	..	8.00
9x 1/2 x .025	18	18	18	24	..	9.00
10x 1/2 x .025	18	14	18	24	..	10.00
12x 1/2 x .025	..	..	..	24	..	12.00
12x 3/4 x .025	18	14	18	..	..	12.00
12x 1 1/4 x .028	14	14	18	..	..	12.00
14x 1 1/4 x .028	..	14	18	..	..	16.20

HAND—FLEXIBLE NO. 2

Size Inches	Regular Stock Blade	Soft Steel Cast Iron	Tool Steel Light Angle Iron	Brass, Copper Drill Rod Iron Pipe Sheet Metals	Thin Tubing Electric Casing Thin Sheet Metals	Price per Gross
8x 1/2 x .025	18	18	18	24	32	8.00
9x 1/2 x .025	18	18	18	24	32	9.00
10x 1/2 x .025	18	14	18	24	32	10.00
12x 1/2 x .025	..	..	..	24	32	12.00
12x 3/4 x .025	18	14	18	..	..	12.00
14x 1 1/4 x .028	14	14	18	..	..	16.20

HAND SPECIAL—FOR HARD HIGH CARBON RAILS

Length.....	12 inches	
Price, Special AA, No. 1, 14 and 18 Teeth.....	per gross	12.00

All lengths given for hand blades measure from center to center of holes.

MACHINE—ALL HARD NO. 4—FOR LIGHT POWER MACHINE WORK

Size Inches	Regular Stock Blade	TEETH PER INCH—FOR CUTTING				Price per Gross
		Steel Rails, An- nealed Tool Steel, Heavy	Light Angle Iron Iron Pipe	HEAVY HIGH SPEED MACHINES RUN WITH CUTTING SOLUTION Tool Steel	Mach. Steel Heavy Angle Iron Small Work	
10x 3/4 x .032	14	14	18	..	..	12.50
12x 3/4 x .032	14	14	14	..	..	14.40
12x 1 x .032	14	14	18	..	..	16.20
14x 1 x .032	14	14	18	..	..	18.90

MACHINE—ALL HARD NO. 4—FOR HEAVY POWER MACHINE WORK

Size Inches	Regular Stock Blade	Soft Steel Cast Iron Bronze	Tool Steel Hard Metals	Mach. Steel Heavy Angle Iron Large Work	Light Angle Iron Steel Rails Small Work	Price per Gross
10x 3/4 x .049	10	10	14	..	..	19.50
12x 3/4 x .049	10	10	14	..	..	23.40
12x 1 x .049	10	10	14	..	..	29.40
12x 1 1/4 x .049	..	..	..	6	8	37.80
14x 1 1/4 x .049	10	10	14	..	..	27.30
14x 1 x .049	10	10	14	8	10	34.30
14x 1 1/4 x .049	..	..	..	6	8	44.10
16x 1 x .049	10	10	14	..	..	39.20
17x 1 x .049	10	10	14	..	..	41.65
17x 1 1/4 x .049	..	..	..	6	8	53.55
17x 1 1/2 x .065	10	10	..	8	10	53.55
17x 1 1/2 x .065	..	..	..	6	8	55.00
18x 1 x .049	10	10	10	..	..	44.10
18x 1 1/4 x .049	..	..	..	6	8	56.70
18x 1 x .065	10	10	10	..	..	56.70
20x 1 x .049	10	10	10	..	..	49.00
24x 1 x .049	10	10	10	..	..	58.80
24x 1 1/4 x .049	..	..	..	6	8	59.60
24x 1 x .065	10	10	..	..	..	75.60
24x 1 1/4 x .065	..	..	..	6	8	130.00

Lengths of No. 4 power blades measure from center to center of holes, excepting 14 and 17 inch lengths; these measure 13 1/2 and 16 1/2 inches. When length only is specified, we will furnish power blades in all lengths up to and including 14 inches, .032 inch thick. Longer lengths up to 24 inches, .049 inch thick; 24 inches and longer, .065 inch thick.

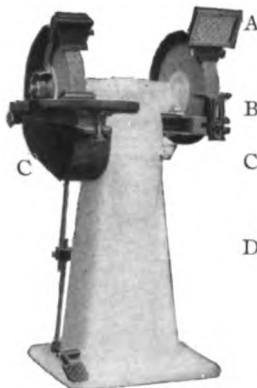
*Regular stock blades always furnished when length only is specified.

CHALLENGE MACHINE CO., INC.

PHILADELPHIA, PA.

Manufacturers of Challenge Grinding-Wheel Machines and Truedge, Gruva, Gardi and Huntingdon Dressers, Etc.

THE CHALLENGE WET TOOL AND DRY GRINDER



A Heavy rolled steel U-shaped wheelguard adjustable to the wear of the wheel—hugs it. Has adjustable glass eyeshield.

B Draw-bar work-rest adjustable in all directions.

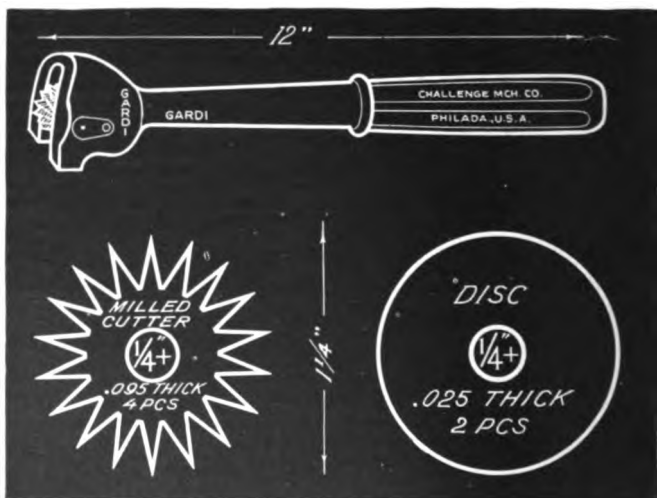
C Wet Tool Attachment operated by foot-power. When at rest the water recedes from the wheel automatically. Beats pumps a mile.

D Three styles of Columns: plain, or with countershaft attached, or with electric motor attached on a knee in the rear. Thus ANY type or make of electric motor may be employed. Four sizes. But you cannot know all the reasons why it should be a Challenge without getting our 30th year catalog.

Manufactured by
Challenge Machine Co., Inc., Philadelphia, Pa.

THE GARDI GRIND- ING WHEEL DRESSER

Manufactured by
Challenge
Machine
Co., Inc.,
Philadel-
phia, Pa.



The ESSENTIAL things in ANY emery wheel dresser are the CUTTER and the DISC. See cuts. And the handle should have a shield to protect the eyes of the operator. Note the closed top of the handle.

When ordering extra CUTTERS, specify The Gardi, known to nearly every shopman as "The kind with split pin fastener."

It will save you money.

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PITTSBURGH PHILADELPHIA
CLEVELAND CINCINNATI MILWAUKEE MANCHESTER, ENG.

Manufacturers of Abrasive Materials, Carborundum and Aloxite Grinding Wheels, Carborundum Paper and Cloth, Aloxite Cloth, Carborundum Brand Garnet Paper, Carborundum Sharpening Stones, Carborundum Valve Grinding Compound and Metallic Silicon

THE RIGHT WHEEL IN THE RIGHT PLACE

This is the secret of efficient and economical grinding. Our service department is at your command to give you the benefit of years of experience in all classes of grinding—to give you proper wheel in just right grit, and just right grade. Let us know about your grinding work—there is a Carborundum or Aloxite wheel to meet every grinding condition.

CARBORUNDUM GRINDING WHEELS

FOR cast iron, brass, bronze, aluminum, general machine shop work, for cylindrical, internal or surface grinding of all metals of low tensile strength; for grinding pearl, marble, rubber, granite and porcelain.

ALOXITE GRINDING WHEELS

FOR the grinding of steels of all kinds; malleable iron, reamers, cutters, drills, planer tools, knife grinding, cylindrical, internal or surface grinding where the material is steel.

Made in any standard shapes or sizes, or in any special shapes or sizes, subject to blueprints.



TRADE MARK



TRADE MARK

MAXF GRINDING WHEEL CORP'N

CHESTER, MASS.

"MaxF"
TRADE MARK

GRINDING WHEELS

By our trade mark "MaxF" (Maximum Efficiency) you shall know a higher efficiency in Grinding Wheels. Better grinding results and bigger production are assured. For behind MaxF Wheels is also a service that brings you the right wheel for your work. Enlarged facilities enable us to make prompt deliveries on special orders and we carry a large stock of wheels from which immediate shipment can be made.



"MaxF" Wheels are manufactured by four different processes, namely Vitrified, Silicate, Elastic and Vulcanite. The differences in the four "MaxF" processes are chiefly differences in bonds and temperatures of fusion.

"MaxF M" Wheels

The wheels which are given the name of "MaxF M" Wheels are made of a combination of the best of natural emery and corundum combined with more or less artificial abrasives to meet the requirements of the material to be ground. These wheels are designed for the rougher and heavier lines of grinding, such as steel castings, malleable iron and general machine shop uses.

"MaxF Sapphite"

Our "MaxF Sapphite" Wheels are made from Sapphite, the purest form of aluminum oxide and a product of the electric furnace. Sapphite is produced under the intense heat of about 4,000 degrees F.

"MaxF Sapphite" Wheels are particularly adapted to the grinding of steel of high tensile strength and precision grinding of materials of like nature. "MaxF Sapphite" Wheels are unexcelled for tool grinding, internal grinding, cylindrical grinding or for any work where time, precision and finish are important factors.

"MaxF Carbo"

Our "MaxF Carbo" Wheels are made from Carbo, also a product of the electric furnace, combining the two elements of Carbon and Silicon and forming an abrasive of extreme hardness.

"MaxF Carbo" Wheels are designed for grinding materials of low tensile strength, such as cast iron, brass, bronze, aluminum, granite, hard rubber and wood and for this class of grinding have no superior.

SHAPES OF WHEELS: "MaxF" Wheels are made in the four common shapes, viz.: Straight, Cup, Cylinder and Dish Shapes, as well as all Special Shapes to fit special grinding machines. In fact, we make wheels for practically all requirements.

NORTON COMPANY

WORCESTER, MASS., U. S. A.

NEW YORK STORE

151 Chambers St.

Electric Furnace Plants

Bauxite Plant

BAUXITE, ARK.

CHICAGO STORE

11 N. Jefferson St.

Manufacturing Plant

WORCESTER, MASS.

NIAGARA FALLS, N. Y.—CHIPPAWA, CAN.

Manufacturers of Alundum and Crystolon Grinding Wheels, Alundum and Crystolon Grain for Polishing, Alundum Refractories and Laboratory Ware, Glass Cutting Wheels, Sharpening Stones, Scythe Stones, Valve Grinding Compound, Rubbing Bricks and Stones, Grinding Wheel Dressers, and Grinding Machinery

ALUNDUM (Al_2O_3) is an artificial abrasive whose hardness, sharpness and toughness are under control during manufacture. This, in combination with its characteristic conchoidal fracture, makes Alundum Grinding Wheels particularly effective upon materials of high tensile strength—notably steel and its alloys.

CRYSTOLON (SiC) is another product of the electric furnace and because of its wonderful purity and remarkable cutting qualities, combined with its greater brittleness, this abrasive has proven highly efficient in grinding cast iron, brass, bronze, aluminum, glass, marble, pearl, and materials of like physical characteristics.

NORTON GRINDING WHEELS are made by four processes: the vitrified, silicate, elastic and rubber. In the vitrified process, the principal bonding ingredient is clay; in the silicate, sodium silicate is largely used; in the elastic process, the bond is made from a special mixture of shellac and other ingredients; while in the rubber process, a special form of vulcanized rubber is utilized.

Wheels can be furnished in various shapes and sizes to meet grinding requirements. Sizes run from as small as $\frac{1}{8}$ " diameter to as large as 60" diameter, while the thinnest wheels made are $\frac{1}{8}$ " thick, and the widest faced 28" thick. All wheels larger in diameter than 5" are subjected to a severe mechanical test before shipment to bring out any inherent weakness.

Wheels are classified by grain and grade, the grain numbers indicating the size of the abrasive cutting particles, while the grade denotes the measure of strength of the bond, or binding material in the wheel which holds the grain in its setting.

GRAIN FOR POLISHING—Alundum and Crystolon grain is used extensively for polishing many kinds of material. Alundum grain is particularly efficient on steel and other metals of high tensile strength.

REFRACTORIES—Owing to the high refractory properties possessed by Alundum this substance has been found unequalled for the manufacture of refractory and laboratory ware. Alundum is made into electric furnace cores, tubes, muffles, crucibles, combustion boats, filtering crucibles, cones, extraction thimbles and refractory cements.

GLASS CUTTING WHEELS—One of the most recent products developed by Norton Company is an assortment of Alundum glass cutting stones.

Any of these Booklets will be sent on request

Grinding Wheel Catalog

Alundum—Crystolon Booklet

Polishing—What to Use—How to Use It

Norton Refractories—Alundum and Crystolon

Saw Sharpening

The Grinding of High Speed Steel

Tool Grinding

Safety as Applied to Grinding Wheels

Safety in Cutlery Grinding

Grinding Wheel Dressers

Grinding Wheels for the Saw Mill

Alundum and Crystolon in the Glass Industry

Bushing Grinding Wheels

Little Known Facts about Grinding

Grain and Grade as Applied to Grinding Wheels

SPECIAL RESEARCH SERVICE—We have well-equipped research laboratories with a competent staff of research engineers and demonstrators who are always ready to give you the benefit of their special knowledge and wide experience in the solving of your special problems.

Alundum

TRADE MARK



Crystolon

TRADE MARK

THE STERLING GRINDING WHEEL COMPANY

TIFFIN, OHIO, U. S. A.

CHICAGO HOUSE
30-32 N. Clinton St

NEW YORK
The L. Best Co., 75 Barclay St.
Selling Agents

Grinding Wheels and Machinery

Corundum

Artificial
Corundum

Carbolon
(SiC)



Vitrified

Silicate

Elastic

A GRINDING WHEEL FOR EVERY PURPOSE

Sterling Wheels are made by three processes, Vitrified, Silicate, and Elastic. The Vitrified process in the usual bonding in clay. The Silicate process has Sodium Silicate as its base. The Elastic process is a special bonding material made up of Shellac and other ingredients.

Sterling Wheels will be furnished in any standard shapes, made by any of the several processes used, and from the best kinds of material which are to be had at the present time.

GRINDING MACHINERY

We aim to furnish anything that is needed in the Grinding line and will be glad to have your inquiries and specifications. Prices are right. The goods are right. And Sterling Machinery will please you.



D & W FUSE COMPANY

PROVIDENCE, R. I.

"D & W" MAGNETIC CHUCKS

Heatproof—Oilproof—Waterproof



Flat



Rotary

"D & W" Magnetic Chucks are designed to secure the maximum effective holding surface, with exceptionally strong and uniform pull throughout, whereby a wider range of work can be machined than was formerly practicable.

The magnet coils in "D & W" Chucks are wound and insulated by a special process which protects them from heat and moisture.

All chucks are equipped with special enclosed type demagnetizing switches, for automatically releasing the work.

We also manufacture a complete line of specialties, including taper, swivelling chucks, and A. C. and D. C. Demagnetizers. Prices quoted upon application.

"D & W" standard flat and rotary chucks are designed for use on either 105-125 volt or 210-250 volt D. C. circuits, but not on both ranges. In ordering chucks specify voltage of lighting circuit. Alternating current cannot be used.

393

FLAT

ROTARY

Style	Extreme Holding Face	Price Each	Style	Diameter	Price Each
F- 7- 8	8 $\frac{1}{4}$ x 7	\$ 70.00	R- 3	4 $\frac{1}{2}$	\$ 50.00
F- 5-13	13 $\frac{1}{4}$ x 5 $\frac{1}{2}$	85.00	R- 6	6	60.00
F- 7-16	16 $\frac{1}{4}$ x 7	100.00	R- 8	8	70.00
F- 8-20	18 $\frac{1}{2}$ x 9 $\frac{1}{2}$	135.00	R-10	10	90.00
F- 8-24	23 $\frac{1}{2}$ x 9 $\frac{1}{2}$	140.00	R-12	12	125.00
F-10-31	31 $\frac{1}{2}$ x 10 $\frac{1}{2}$	180.00	R-14	14	Special
F-13-21	22 x 13 $\frac{1}{4}$	170.00	R-16	16	Special
F-13-33	33 $\frac{1}{2}$ x 13 $\frac{1}{4}$	240.00	R-18	18	Special
F-10-47	47 $\frac{1}{4}$ x 10 $\frac{1}{2}$	Special	R-20	20	Special
F-13-42	42 $\frac{1}{2}$ x 13 $\frac{1}{4}$	Special	R-24	24	Special
F-14-48	48 $\frac{1}{2}$ x 14	Special	R-30	30	Special
F-12-72	72 $\frac{1}{2}$ x 12 $\frac{1}{2}$	Special	R-38	38	Special
F-12-68	67 $\frac{1}{2}$ x 12 $\frac{1}{2}$	Special			

Complete catalog upon request.

THE HOGGSON & PETTIS MFG. CO.

NEW HAVEN, CONN., U. S. A.

Manufacturers of Lathe Chucks, Special Tools and Machinery, Rubber M^{MA} Supplies, Roll Engraving, etc., Cutting Dies, Steel Stamps

THE SWEETLAND INDEPENDENT CHUCKS

PRICE LIST, DIMENSIONS, ETC.

Code	Size	Size of Hole	Diameter of Recess for Face Plate	Weight	Price
fable	4½ in.	1 in.	4½ in.	7 lbs.	\$20.00
fabric	6 in.	1½ in.	5½ in.	12 lbs.	22.00
facade	8 in.	1¾ in.	4¾ in.	28 lbs.	26.00
facile	9 in.	1¾ in.	5½ in.	32 lbs.	28.00
facet	10 in.	2½ in.	5½ in.	42 lbs.	30.00
faction	12 in.	2½ in.	6½ in.	67 lbs.	35.00
faculty	14 in.	3 in.	6½ in.	84 lbs.	40.00
fagot	16 in.	3 in.	7½ in.	117 lbs.	46.00
faith	18 in.	4 in.	9½ in.	157 lbs.	54.00
falcon	20 in.	4½ in.	9½ in.	184 lbs.	62.00
fame	22 in.	5 in.	11 in.	217 lbs.	70.00
fancy	24 in.	5 in.	11 in.	267 lbs.	80.00
fashion	26 in.	5 in.	12 in.	315 lbs.	93.00
fastness	28 in.	5 in.	13 in.	350 lbs.	110.00
jargon	30 in.	6 in.	15 in.	430 lbs.	130.00



DIMENSIONS

OF ALL

GEARED SCROLL CHUCKS

Numbers 6, 60, 61, 62, 63, 64, 65 and 66

Size	Net Weight Approx. 1 Set Jaws		Gross Weight Approx. 1 Set Jaws		Net Weight Jaws Per Set		Size of Hole	Diameter of Recess for Face Plate	Will Hold	Diameter of Swing
	3 Jaws	4 Jaws	3 Jaws	4 Jaws	3 Jaws	4 Jaws				
2½	.....	.....	2	.....	.....	.....	¾	1¾	2½	2¾
3	.....	.....	3¾	4	.....	.....	¾	2H	3¾	3¾
4	7¾	7¾	7¾	7¾	¾	1	1	3	4¾	4¾
5	10¾	11	11	11¾	1¾	1¾	1¾	3H	5¾	5¾
6	16¾	16¾	17¾	17¾	1¾	3	1¾	4¾	6¾	6¾
7½	26	28¾	20	31¾	3	4	2	4¾	8¾	8¾
9	38	40	41	46¾	3¾	5¾	2¾	5	10¾	10
10½	53	53¾	61	61¾	5¾	7¾	3	5¾	11¾	11¾
12	69	73¾	81	85	8	11¾	3¾	6H	13	12¾
15	114	117	128	131	8	12	3¾	6H	16	15¾

COMMON Jaws are Styles No. 61 and 62
 REVERSE Jaws are Styles No. 63 and 64
 REVERSIBLE Jaws are Styles No. 6 and 60

Three Jaw Chucks Styles No. 61, 63			Four Jaw Chucks Styles 62, 64		
Code	Size	Price	Code	Size	Price
ingot	2½ in.	\$14.00	inland	3 in.	\$19.00
inhale	3 in.	17.00	inmate	4 in.	21.00
inlet	4 in.	19.00	inmost	5 in.	23.00
install	5 in.	21.00	indorse	6 in.	27.00
issue	6 in.	24.00	induce	7½ in.	30.00
inward	7½ in.	27.00	indulge	9 in.	36.00
inveigh	9 in.	33.00	incense	10½ in.	42.00
insect	10½ in.	38.00	india	12 in.	50.00
insight	12 in.	45.00	indigo	15 in.	65.00
insipid	15 in.	60.00			

TWO SETS OF JAWS ARE STYLES No. 65 and 66

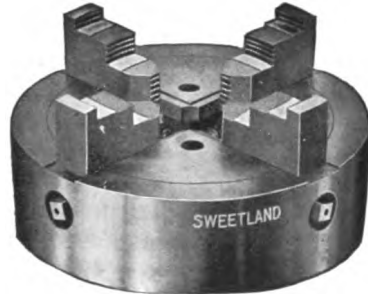
Three Jaw Chucks Style No. 65			Four Jaw Chucks Style No. 66		
Code	Size	Price	Code	Size	Price
ingulf	2½ in.	\$17.00	incase	3 in.	22.00
inject	3 in.	20.00	inboard	4 in.	24.00
insist	4 in.	22.00	incage	5 in.	27.00
instep	5 in.	24.00	incise	6 in.	31.00
iris	6 in.	28.00	inclose	7½ in.	36.00
invest	7½ in.	32.00	inclose	9 in.	42.00
intruse	9 in.	38.00	incrust	10½ in.	49.00
intrude	10½ in.	44.00	incur	12 in.	58.00
inform	12 in.	52.00	incurrate	15 in.	76.00
inflict	15 in.	70.00			

THE HOGGSON & PETTIS MFG. CO.

THE SWEETLAND COMBINATION LATHE CHUCKS



WITH REVERSIBLE JAWS



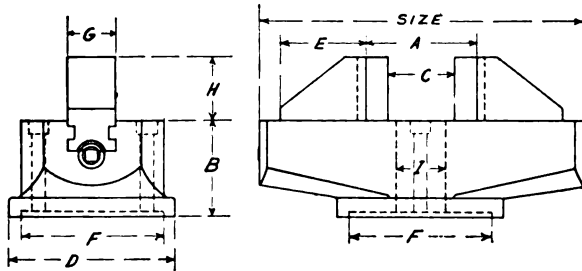
WITH COMMON JAWS

These Chucks Can Be Furnished from Stock

With Three or Four Jaws as Desired

Size	Net Weight Approx.		Gross Weight Approx.		Diameter of Swing	Will Hold	Size	Diameter of Recess for Face Plate	Price List	
	3 Jaw	4 Jaw	3 Jaw	4 Jaw					Three Jaw	Four Jaw
Ins.	Lbs.	Lbs.	Lbs.	Lbs.	Ins.	Ins.	Ins.	Ins.		
6	20	21	23	24	8	6½	1¼	3½	\$ 35.00	\$ 42.00
9	33	36	41	44	10½	9½	1½	5	45.00	54.00
12	60	65	73	78	13¾	12¼	1¾	5½	56.00	66.00
15	80	84	94	98	16¼	15¼	1¾	5¾	70.00	82.00
18	110	116	129	135	19	18½	2	9	87.00	102.00
21	125	147	148	168	22¾	21½	2¼	9	110.00	130.00
24	145	162	170	187	25¾	24½	2½	9	136.00	160.00
30	332	383	379	430	32	30½	4½	12½	200.00	240.00
36	465	529	484	540	38½	36½	4½	12½	264.00	325.00
42	610	640	675	700	44½	42½	4½	24	360.00	450.00

THE SWEETLAND BOX BODY CHUCK



Can Be Furnished as Universal or Independent. Slip Jaws, Tool or Soft Steel

Size	Weight each	A	B	C	D	E	F	G	H	I	Code	Price
in.		in.	in.	in.	in.	in.	in.	in.	in.	in.		
7	20 lbs.	3	3	1½	4½	2	3½	1½	1½	1½	eared	\$28.00
9½	38 lbs.	4	3½	2½	5½	2½	4½	2	2½	2	earl	33.00
12	50 lbs.	6	3¾	4	6	3	5	2½	2½	2½	earth	40.00
15	75 lbs.	8	4½	6	7¾	3½	6½	2½	3	2½	casel	50.00
18	100 lbs.	10	4½	8	7¾	4	6½	2½	3½	2½	cause	75.00

(Continued on next page)

(Continued from preceding pages)

THE HOGGSON & PETTIS MFG. CO.

NEW HAVEN, CONN.

HAND CUT STEEL LETTERS AND FIGURES



The proper grade of steel is used in the construction of these hand cut steel figures and letters. A size suitable for the letter to go on it is used, and is long enough so it can be held without hitting the fingers.

Size, inches	★	1/24	1/20	★	1/12	★	1/10	3/8	★	★
Price, Figures, per set.....	2.50	2.00	1.50	1.50	1.50	1.50	1.50	1.50	1.75	2.00
Price, Letters, per set.....	7.50	6.00	4.50	4.50	4.50	4.50	4.50	4.50	5.25	6.00
Price, Letters or Figures, each ...	.35	.30	.20	.20	.20	.20	.20	.20	.25	.30

Size, inches	★	1/4	★	3/8	1/2	3/4	7/8	1		
Price, Figures, per set.....	2.20	2.35	2.85	3.35	4.20	4.70	6.80	9.40	12.95	15.70
Price, Letters, per set.....	6.50	7.00	8.50	10.00	12.50	14.00	20.40	28.20	38.75	47.00
Price, Letters or Figures, each ...	.30	.35	.40	.45	.60	.65	.80	1.10	1.45	1.75

396

MARKING ROLL

HAND CUT STEEL STAMPS



HAND CUT STEEL STAMPS

Of all kinds and for all purposes. The work is all strictly hand cut, the letters being correctly shaped and the stamps properly tempered to suit the work they are to do. Price list is for plain letter hand stamps only.

Size, inches	★	1/24	1/20	★	1/12	★	1/10	3/8	★	1/2	3/4	7/8	1						
Price, per letter	.20	.20	.15	.15	.15	.15	.15	.18	.20	.20	.25	.30	.40	.45	.50	.75	1.00	1.25	1.50

Stamps with letters over 7/8 inch will be charged extra at the rate of 50 cents per pound for steel and forging.

MARKING ROLLS AND MACHINE STAMPS

Estimates cheerfully given for machine stamps and marking rolls, completing or for cutting same only. Also for fancy lettering and special designs; stamps for difficult places and shapes.

J. H. WILLIAMS & CO.


70 RICHARDS ST., BROOKLYN, N. Y.

Western Office and Warehouse, 70 So. Clinton St., CHICAGO

Manufacturers of Drop-Forgings

WILLIAMS' SUPERIOR DROP-FORGINGS AND DROP-FORGED TOOLS

STANDARD STOCK LINES

of "Agrippa,"  and "Vulcan" Brands
of Tools and Forgings, including

Drop-Forged Wrenches

About 1000 Sizes in 40 Patterns.

Tool Holders

for the economical use of High Speed Steel
in Turning, Planing, Boring, Threading,
Knurling, Cutting-off, Side Work, etc.

Lathe Dogs

The "Safety" kind—Capacities $\frac{3}{8}$ to
6 inches.
Bent and Straight Tail—One or Two
Screws.

"C" Clamps

Four Patterns—for Heavy, Medium or
Light Service and Tool Makers.

Strap Clamps

To replace old, clumsy, hand-made affairs
for clamping work on Planer, Lathe,
Drill-Press, etc.

Chain Pipe Wrenches and Vises

With "proof-tested" Flat Link or Cable
Chain.

Eye Bolts

Plain and Shoulder— $\frac{1}{4}$ to $2\frac{1}{2}$ " diameter
Shanks—Blank or Threaded.
Heat-treated and "proof-tested."

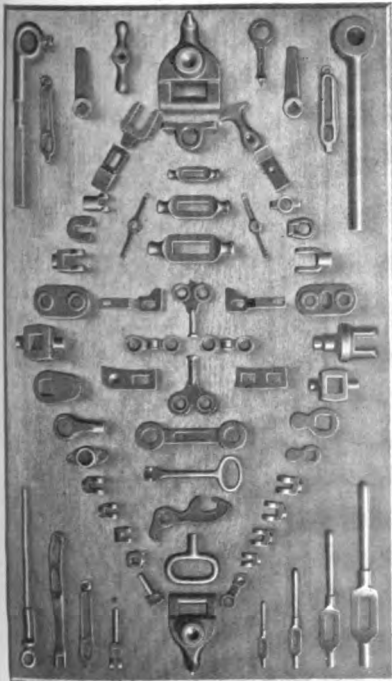
Hoist Hooks

With Shank or Eye, heat-treated and
"proof-tested."

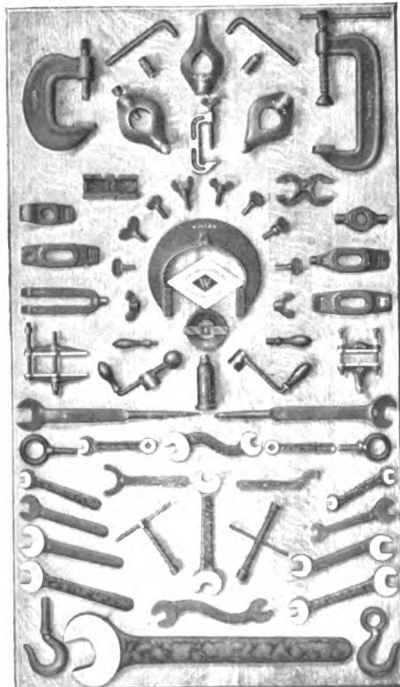
SPECIAL FORGINGS

Small or large, to order for "Quality"
work—Airplane and Automobile Crank-
shafts, Connecting Rods, etc., from
straight carbon and alloy steels. Our
Forge Equipment includes machines with
falling weights running from 300 lbs.
Board to 12,000 lbs. Steam Drop-
hammers.

Ask for Pocket Catalog—it's free



Special Forgings



Stock Forgings

THE CINCINNATI BALL CRANK CO.

CINCINNATI, OHIO

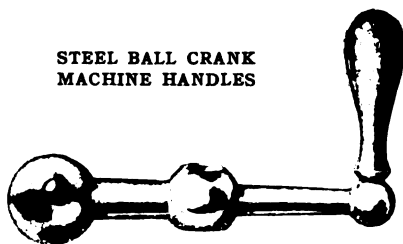
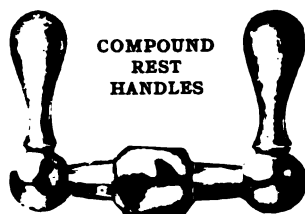
BRANCH OFFICE: 1224 Dime Bank Bldg., DETROIT, MICH.

Manufacturers of Steel Products

HANDLES FROM STEEL

For power tools and similar purposes

Milled from the bar, drilled, faced and key-wayed to specifications. Highly finished, accurate, complete on receipt and ready to attach.

STEEL BALL CRANK
MACHINE HANDLESCOMPOUND
REST
HANDLES

No.	Length Over All	Center Ball	Large End Ball	Small End Ball
0	3	$\frac{7}{8}$	1	$\frac{5}{8}$
1	$3\frac{1}{2}$	1	$1\frac{1}{4}$	$\frac{3}{4}$
$1\frac{1}{2}$	4	$1\frac{1}{4}$	$1\frac{1}{4}$	$\frac{1}{2}$
2	$4\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$\frac{1}{2}$
3	5	$1\frac{1}{4}$	$1\frac{1}{4}$	1
4	$5\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{4}$	1
5	6	$1\frac{1}{4}$	$1\frac{1}{4}$	1
6	$6\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{4}$	1
7	7	$1\frac{1}{4}$	$1\frac{1}{4}$	1
8	$7\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{4}$	1
9	8	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{8}$
10	$8\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{8}$
11	9	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{8}$
12	11	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{8}$
13	13	$1\frac{1}{2}$	2	$1\frac{1}{4}$

Center ball can be drilled and faced any size desired.

No.	Length Over All	Center Ball	End Balls	
1	$2\frac{1}{2}$	$1\frac{1}{4}$	$\frac{3}{4}$	No handle in ends
2	$2\frac{1}{2}$	$1\frac{1}{4}$	$\frac{3}{4}$	Handle in one end
3	$2\frac{1}{2}$	$1\frac{1}{4}$	$\frac{3}{4}$	Handle in both ends
4	3	$1\frac{1}{4}$	$\frac{3}{4}$	No handle in ends
5	3	$1\frac{1}{4}$	$\frac{3}{4}$	Handle in one end
6	3	$1\frac{1}{4}$	$\frac{3}{4}$	Handle in both ends
7	$3\frac{1}{2}$	$1\frac{1}{4}$	$\frac{3}{4}$	No handle in ends
8	$3\frac{1}{2}$	$1\frac{1}{4}$	$\frac{3}{4}$	Handle in one end
9	$3\frac{1}{2}$	$1\frac{1}{4}$	$\frac{3}{4}$	Handle in both ends
10	4	$1\frac{1}{4}$	$\frac{3}{4}$	No handle in ends
11	4	$1\frac{1}{4}$	$\frac{3}{4}$	Handle in one end
12	4	$1\frac{1}{4}$	$\frac{3}{4}$	Handle in both ends

Center ball can be drilled and faced any size desired.

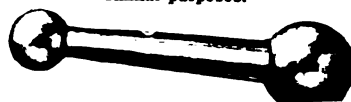
MACHINE HANDLES



No.	Length of Shank	Length Over All	Diameter of Shank
000	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{4}$
00	$\frac{1}{2}$	2	$\frac{1}{4}$
0	$\frac{1}{2}$	$2\frac{1}{4}$	$\frac{1}{4}$
1	$\frac{3}{4}$	$2\frac{3}{4}$	$\frac{1}{4}$
2	$\frac{3}{4}$	$3\frac{1}{4}$	$\frac{1}{4}$
3	$\frac{3}{4}$	$3\frac{1}{2}$	$\frac{1}{4}$
4	$\frac{3}{4}$	4	$\frac{1}{4}$
5	$\frac{7}{8}$	$4\frac{3}{8}$	$\frac{1}{4}$
6	1	$4\frac{7}{8}$	$\frac{1}{4}$
7	1	$5\frac{1}{8}$	$\frac{1}{4}$
8	$1\frac{1}{4}$	$5\frac{3}{4}$	$\frac{1}{4}$

TWO BALL LEVERS

Adapted for Tail Stock, Tighteners, Drill Press Clamps, Back Gear Levers, and for all similar purposes.



No.	Length Over All	Large End Ball	Small End Ball
2	$4\frac{1}{2}$	$1\frac{3}{4}$	$\frac{1}{2}$
4	$5\frac{1}{2}$	$1\frac{3}{4}$	1
6	$6\frac{1}{2}$	$1\frac{3}{4}$	1
8	$7\frac{1}{2}$	$1\frac{3}{4}$	1
10	$8\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{4}$
11	9	$1\frac{3}{4}$	$1\frac{1}{4}$

Large ball can be drilled and faced any size desired.

Manufactured as a specialty and sold below the manufacturing cost of cast iron or forged handles.

BABSON-DOW MANUFACTURING CO.

Established 1912

60 FULDA ST., BOSTON, MASS.

Screw Machine Products



"PARTS THAT FIT"

We manufacture

**STEEL, BRASS, COPPER
ALUMINUM AND GERMAN SILVER
PARTS**

specializing in High Finish and
Accuracy.

Modern equipment insures uniform
quality and precision.

Our Machines
are adapted for
all varieties of
Screw Machine
and Turret
Lathe Work.
Our Automatics
produce work
from the solid
bar in sizes
 $\frac{1}{4}$ "-4 $\frac{1}{4}$ ".



399

**BABSON-DOW PRODUCTS
STAND FOR QUALITY
AND ACCURACY**

Send us samples
or blue prints for quotation.

Goods supplied
case-hardened and ground when desired.

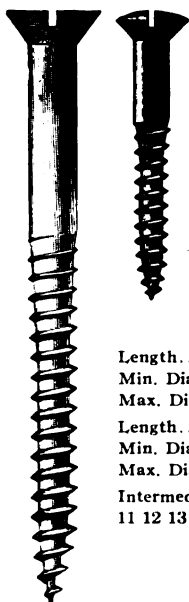


AMERICAN SCREW COMPANY

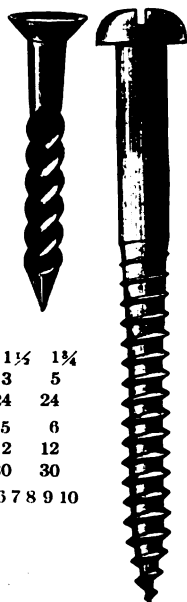
PROVIDENCE, R. I.

Makers of Wood Screws, Machine Screws, Stove Bolts, Tire Bolts, Rivets, etc.

Flat Head Oval Head



Drive Screw Round Head



WOOD SCREWS

Flat and Round Head Wood Screws are regularly made in Iron in the following sizes, and in Brass in sizes of approximately the same variety; other kinds of Wood Screws are made in the sizes commonly used.

Length.....	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$
Min. Dia....	0	0	1	1	2	2	3	3	3	5
Max. Dia....	4	9	12	14	16	16	20	24	24	24
Length.....	2	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{2}$	4	$4\frac{1}{4}$	5	6
Min. Dia....	5	5	5	6	6	8	8	12	12	12
Max. Dia....	24	24	24	24	26	26	30	30	30	30

Intermediate diameters advance as follows: No. 0 1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 20 22 24 26 28 30

MACHINE SCREWS

Flat, Round, and Fillister Head Machine Screws are regularly made in Iron in the following sizes, and in Brass in sizes of approximately the same variety:

Length....	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$1\frac{1}{4}$	1	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$
Min. Dia..	2	2	2	2	2	2	2	4	4	4	4	4	4
Max. Dia..	10	14	16	24	24	24	24	34	34	34	34	34	34
Length....	$1\frac{1}{4}$	2	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$	4			
Min. Dia..	4	4	5	7	7	7	9	9	4	4			
Max. Dia..	34	34	34	34	30	30	30	30	30	30			

Intermediate diameters advance as follows: No. 2 3 4 5 6 7 8 9 10 12 14 16 18 20 24 30 34

Flat Head



Round Head



Fillister Head



Diameter No.	2	3	4.5	6	7	8	9.10	12	14
Threads per in.	48.56.64	48.56	32.36.40	30.32.36	30.32	30.32.36	24.30.32	20.24	18.20.24
	16.18	20	24	30	34				
	16.18.20	16.18	14.16.18	14.16	13				

Regular Side Knob Screws  are $\frac{3}{8}$ inch No. 9, 24 thread.

AMERICAN SCREW COMPANY

STOVE BOLTS



Flat and Round Head Iron Stove Bolts are regularly made in the following sizes:

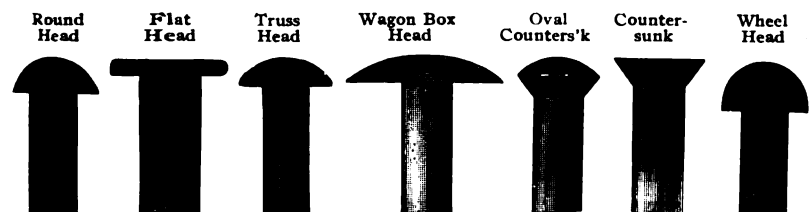
Diameter.....	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$1\frac{1}{2}$
Min. Length.....	$2\frac{1}{8}$	$2\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{1}{4}$	$6\frac{1}{2}$	3
Max. Length.....	2	2	6	6	6	6	6	3

The length advances by eighths of an inch from $\frac{3}{8}$ to $\frac{1}{2}$, then by quarters to $6\frac{1}{2}$.

STOVE RODS

Stove Rods are the same as Stove Bolts in every respect excepting length. They are regularly made in Iron of $\frac{1}{8}$ and $\frac{1}{4}$ diameter in length from 7 to 40", advancing by halves of an inch.

RIVETS



Cold-headed Rivets are made in great variety of styles and sizes up to $1\frac{1}{8}$ in. diameter and 6 in. length.

MEASUREMENTS

The length includes the head of Flat Head Screws, Stove Bolts, and Stove Rods; excludes the head of Round and Fillister Head Machine Screws and Round Head Stove Bolts and Stove Rods; includes the countersink of Oval Head Screws and about half the head of Round Head Wood Screws, but the practice with regard to Round Head Wood Screws is not uniform with all makers.

The length of Rivets is exclusive of the head for all styles with a right angle under the head, and inclusive of the countersink for countersunk heads.

The diameter of Screws is measured by the American Screw Gauge, the equivalent in inches being:

0	.0578	5	.1236	10	.1894	15	.2552	22	.3474
1	.0710	6	.1368	11	.2026	16	.2684	24	.3737
2	.0842	7	.1500	12	.2158	17	.2816	26	.4000
3	.0973	8	.1631	13	.2289	18	.2947	28	.4263
4	.1105	9	.1763	14	.2421	20	.3210	20	.4526
								34	.5053

The diameter of Rivets is measured by the old Standard Birmingham Wire Gauge, the equivalent in inches being:

000	.425	2	.284	6	.203	10	.134	14	.083
00	.380	3	.259	7	.180	11	.120	15	.072
0	.340	4	.238	8	.165	12	.109	16	.065
1	.300	5	.220	9	.148	13	.095	17	.058
								18	.049

CINCINNATI SCREW CO.

TWIGHTWEE, OHIO

(Cincinnati Suburb)

Screw Machine Products

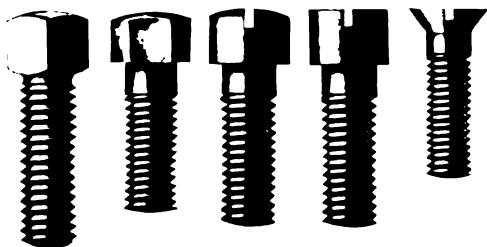
ANY PART TURNED FROM BAR

We are fully equipped to make from specifications a large variety of parts used on automobiles, aeroplanes, steamships, carburetors, electrical apparatus, telephones, firearms, lubricators, bicycles and motorcycles, spark plugs, typewriters, phonographs, machine tools, gas and steam engines, automobile accessories, Ford parts for jobbers, such as cones, rollers, cylinder bolts, plain and castellated nuts; also manufacture a full line of standard set and cap screws, all milled from solid bar.

We are splendidly equipped to make any part from any metal up to four inches in diameter.

Only a special cold drawn steel screw stock, which has proven uniform for threading and forming, is used; this high quality of stock runs true to size and gives better wearing qualities to the screws.

SET AND CAP SCREWS (Milled from Steel Bar)



Set Screws: Diameters of screw range from $\frac{1}{4}$ to $1\frac{1}{4}$ inches and length under Head to Extreme Point from $\frac{1}{2}$ to 5 inches. Staple sizes usually carried in stock.

Square Head Cap Screws are made to order only.

Hexagon Head Cap Screws: Staple sizes usually carried in stock.

Round and Fillister Head Cap Screws: Staple sizes usually carried in stock.

Flat and Button Head Cap Screws: Made to order only.

Steel Washers: Finished.

MILLED NUTS



Castellated



Finished
Case Hardened



Semi-finished

All sizes carried in stock.

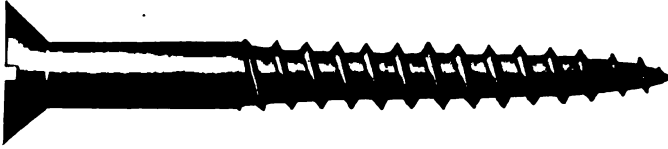
Estimates submitted on special parts from specification, blue print or sample.

Illustrated catalog furnished on application.

CORBIN SCREW CORPORATION

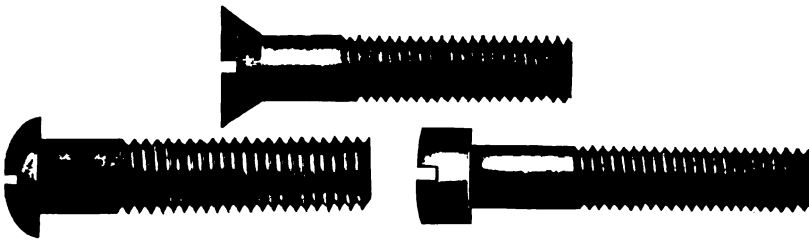
NEW BRITAIN, CONN.

WOOD SCREWS



Made in flat, round, and oval head of iron, brass and bronze.

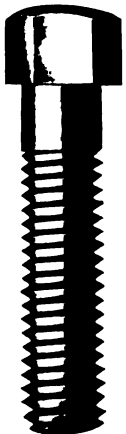
MACHINE SCREWS



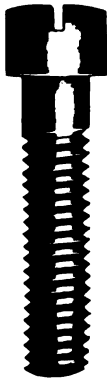
Made in flat, round and fillister head of iron and brass.

CAP AND SET SCREWS

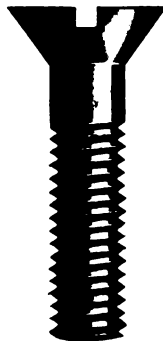
Milled from Solid Bar



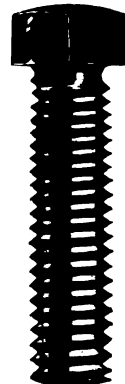
Hexagon
Cap



Fillister
Cap



Flat
Cap



Round Point
Set

403

Also Manufacturers of Stove and Tire Bolts, Jack and Safety Chain, Plain and Castle Nuts, Saw and Drive Screws, Coaster Brakes, Speedometers.

Catalogue on request.

SAMUEL J. SHIMER & SONS

Established 1868

MILTON, PA.

Manufacturers of Machine Parts Made of Iron, Steel or Brass

The making of standard Set and Cap Screws of iron forms a liberal part of our production. Screws and turned parts of special design, wanted in quantity, are quoted upon receipt of samples and specifications. We make all threads to adopted standards, preserving sizes carefully, and guarantee our work equal to the best.

CAP AND SET SCREWS

From stock or made promptly to order in lots of 100 or more.

Iron Set Screws

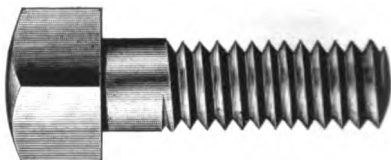
They are finished with black or ground heads, oval or cup point. Diameters of screw range from $\frac{1}{4}$ to $1\frac{1}{4}$ inches and length under Head to Extreme Point from $\frac{1}{2}$ to 5 inches. All other shapes are made per order and quoted "special," prices being based on quantity.

All Set Screws are case-hardened and heads are ground before hardening.



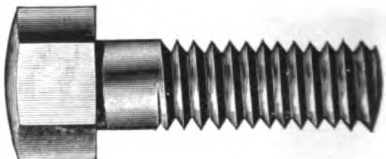
Square Head Cap Screws

We use a splendid refined bar iron for all Cap Screws kept in stock of every size to meet the requirements of the user.



Hexagon Head Cap Screws

We make all Hexagon Head Cap Screws per order, keeping in stock for immediate use, Cold Drawn Steel for any size listed. With U. S. or V threads to specifications.

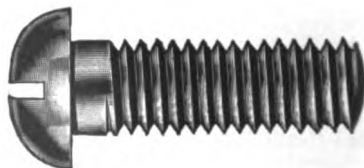
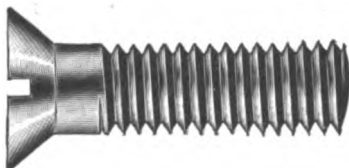


Round and Fillister Head Cap Screws

Diameters of screw range from $\frac{1}{8}$ to 1 inch and length under Head to Extreme Point from $\frac{1}{4}$ to 6 inches.

Flat and Button Head Cap Screws

Milled from Solid Bar



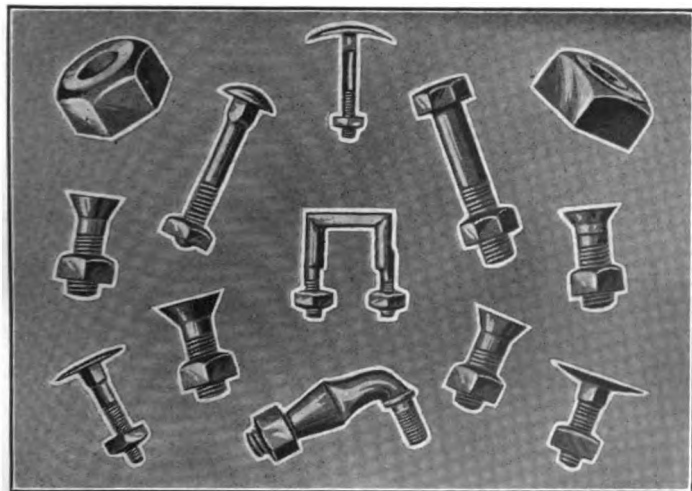
Send for Catalogue No. 33 giving Standard List Prices.

THE COLUMBUS BOLT WORKS CO.

COLUMBUS, OHIO

Bolts, Nuts, Rivets and Special Forgings

Over 40 years' experience in manufacturing these lines insures best quality.



405

Bind Quality with Quantity

Our Bolts, Nuts, Carriage Hardware and Automobile Forgings are upholding the reputation of many products.

Write for Catalog E.

Send blue prints with quantity wanted for prices on Special Forgings.

Eagle Carriage Bolts

Rivets

Common Carriage Bolts

Washers

Machine Bolts

Lag Bolts

Step or Fender Bolts

Cold Punched Nuts

Hot Pressed Nuts

Drop Forgings to Blue Print

THE MILTON MANUFACTURING CO.

MILTON, PENNA.

**Manufacturers of Cold Punched and Hot Pressed Nuts, Wrought Washers
Refined Bar Iron**

"MILTON" NUTS

Cold Punched Chamfered Square or Hexagon—Plain Square or Hexagon—
Hot Pressed Square or Hexagon (Blank with drilled holes or tapped to
Pratt & Whitney Standard)—Semi-finished—Finished, Finished Case Hardened,
Slotted and Castle.



From the purchase of the raw materials until the finished product is ready for shipment, the manufacture of "Milton" Nuts is under the constant supervision of men who know, theoretically as well as practically, thus assuring the purchaser of receiving an absolutely uniform Nut, rendering a superlative degree of Efficiency at all times.



Many builders of the most intricate machinery are specifying "Milton" Nuts exclusively, owing to their accuracy, which admits of rigid construction and prevents vibration, at the same time adding mechanical refinement to their machines.



We have faith that, knowing our materials and their uses by technical and practical knowledge, we can meet in our line the highest scientific requirements.

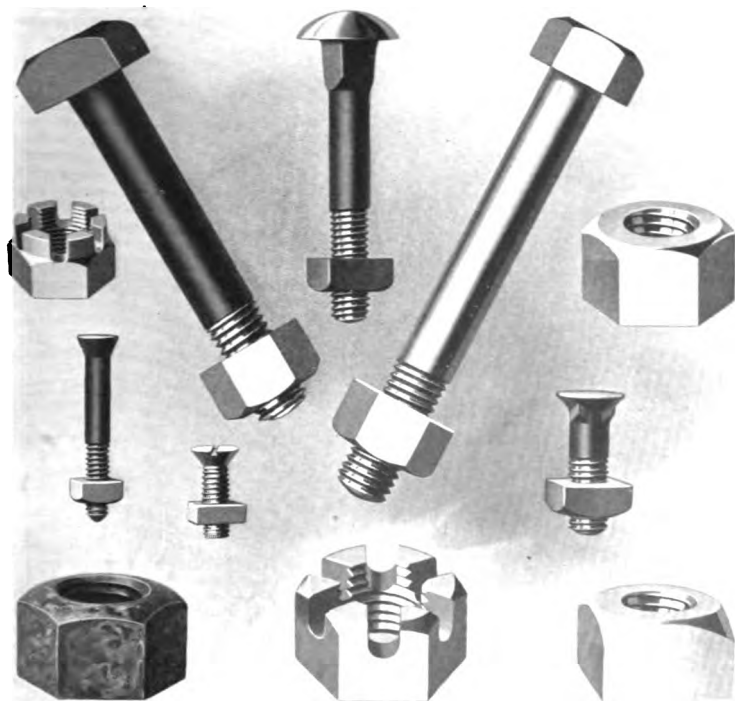


RUSSELL, BURDSALL AND WARD BOLT AND NUT COMPANY

PORT CHESTER, N. Y.

ROCK FALLS, ILL.

Manufacturers of All Kinds of Bolts, Nuts and Rivets



407

"EMPIRE" BOLTS AND NUTS

Carriage Bolts
Machine Bolts
Coupling Bolts
Stud Bolts
Tap Bolts
Plow and Cultivator
Bolts

Stove Bolts
Tire Bolts
Rivets and Special Bolts
of all descriptions
Cold Punched, Chamfered
and Trimmed Hexagon
and Square Nuts

A.L.A.M. Plain and Cast-
telled Nuts
Master Mechanics' Cas-
tle Nuts
Semi-finished, Full Fin-
ished and Case Hard-
ened Nuts

Our Trade Mark:

"EMPIRE"

signifies a certain standard of excellence that invites your investigation.

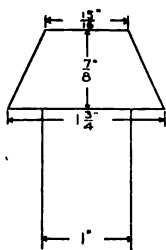
THE CHAMPION RIVET COMPANY

Established 1898

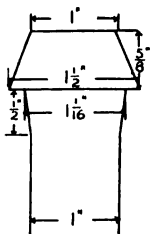
CLEVELAND, OHIO

WESTERN PLANT, EAST CHICAGO, IND.

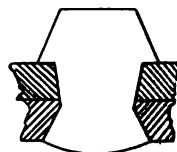
Manufacturers of Boiler, Ship, Structural and Tank Rivets



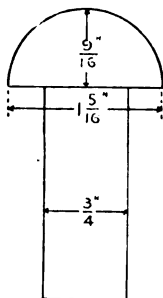
CONE HEAD
STRAIGHT NECK



PAN HEAD
SWELL NECK



PAN HEAD
SWELL NECK
WHEN DRIVEN



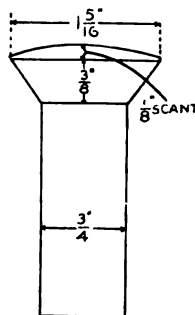
BUTTON HEAD

VICTOR STEEL RIVETS

Rivets, though seemingly unimportant, are the most important units entering into the construction of any steel structure.

Upon their quality and the method of driving them, life and property depend.

Mechanical Engineers and Marine Architects specify them freely.



OVAL
COUNTERSUNK

We publish one of the most interesting booklets on this subject. It is entitled **SCIENTIFIC FACTS**, and is yours for the asking. You will find it contains more information on this seemingly simple subject than has ever been written.

Our rivets conform to Standard specifications such as

A. S. M. E. Code.

American Society for Testing Materials.

American Bureau of Shipping.

U. S. Navy Specifications.

Lloyd's Register of Shipping.

Full data and record of tests furnished on application.



ON EVERY HEAD

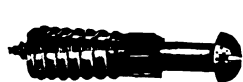
DIAMOND EXPANSION BOLT CO.

90 WEST ST., COR. CEDAR, NEW YORK

FACTORY: GARWOOD, N. J.

Manufacturers of "Diamond Specialties:" Expansion Bolts and Anchors, Drills, Cable and Pipe Clamps, Conduit Rods, etc.

DIAMOND EXPANSION BOLTS



"Diamond N" Screw Anchors—
Patented



"Diamond N" Expansion Shields—Patented

"DIAMOND N" TWO PART SHIELDS AND SCREW ANCHORS are used with a standard lag screw and wood screw threads.

For attaching light and heavy equipment to brick, stone or concrete walls.

DIAMOND "RAPID FIRE" DRILL



"Rapid Fire" Drill

Reduces cost of drilling hole in brick, stone and concrete. Strikes eight sharp blows with each turn of the crank. Points are interchangeable for all sizes of holes.

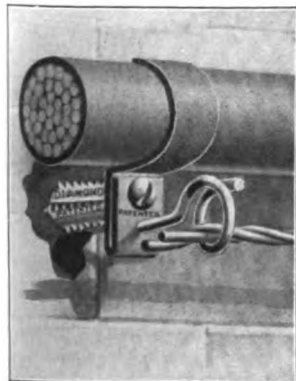


"LONG-SAUT" CABLE AND PIPE CLAMPS

Used for attaching lead cable and parallel runs of bridle wire in *interior block distribution*.

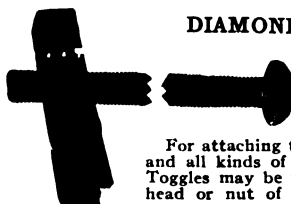
This form of telephone construction is now being employed in all modern telephone plants.

"Long-Saut" Clamps are made to conform to every diameter of cable and may be used with or without bridle rings, as conditions require. Attached with Diamond Screw Anchors to brick, stone or concrete or with wood screws to wooden structures.



"Long-Saut" Clamps

DIAMOND REVERSIBLE



TOGGLE
BOLTS

For attaching to hollow tile Stucco and all kinds of metal Lathe Walls. Toggles may be used with either the head or nut of stove bolt exposed.

EMPIRE CONDUIT RODS

Patented No. 911,854, Feb. 9, 1909.



With or without Wheels
Made of best quality Hickory with quick-acting Automatic Couplings.

DIAMOND GUY ROD HEAD

Weldless—Threadless—Thimbleless

BRIDLE RINGS

Enameled
and
Galvanized



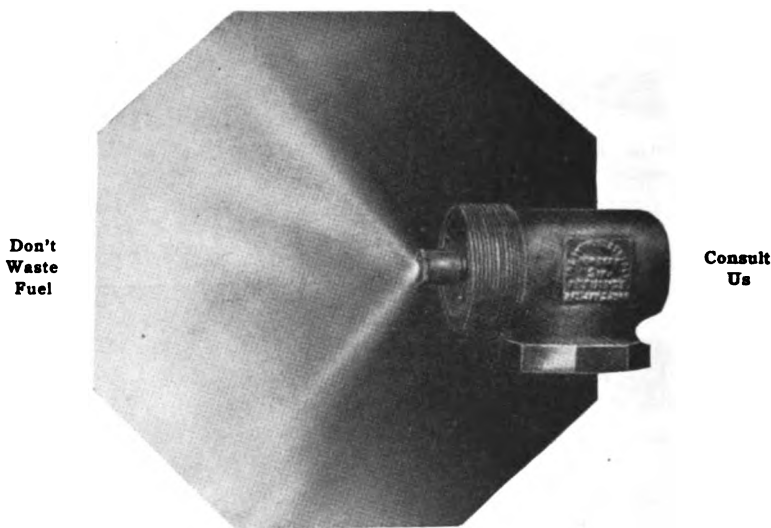
The Diamond Guy Rod is formed by using a square headed machine bolt of the length and diameter required in connection with the Diamond Guy Head.



THE ANTHONY COMPANY

138 WEST AVENUE, LONG ISLAND CITY, N. Y.

Liquid Fuel Engineers



A Perfect Mist of Oil

ANTHONY NEBULYTE OIL BURNERS

Low and High Pressure Designs to Suit Every Requirement.
A Trial Proves Their Unequalled Operating Characteristics.

ANTHONY NEBULYTE OIL-GAS BURNERS

For Use with Either of These Fuels, or Both in Combination. No High Pressure Air Required.

ANTHONY CRUCIBLE FURNACES

Large Output, Low Operating Cost, Long Crucible Life.
Soft Flame, Small Shrinkage, Non-oxidized Metal.

ANTHONY RIVET FORGES

Compact, Portable, Economical, the Equal of Four Coal Forges.

ANTHONY OIL AND GAS BURNING EQUIPMENT

For Annealing, Hardening, Forging, Melting—All Purposes.
Designs Supplied at Reasonable Cost.

ANTHONY OIL AND GAS BURNING SYSTEMS

For Industrial Heating Processes.

For House Heating Uses.

ANTHONY NEBULYTE SPRAYS

For Water-Gas Machines.

For Any Other Purpose

W. N. BEST, INC.

11 BROADWAY, NEW YORK

Engineers in Caloric: Liquid Fuel Equipment; Furnaces for Heating, Melting and Heat Treatment of Metals. High Pressure, Low Pressure, Volume Air, Air Carburetting and Mechanical Burners of All Sizes

W. N. BEST CALOREX LIQUID FUEL FURNACES AND EQUIPMENT

Twenty-seven Years' Experience in Handling Liquid Fuel. All Installations Guaranteed.

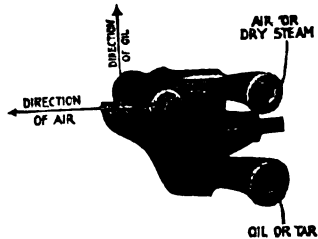
Designs for changing coal-fired furnaces to oil-fired, for the remodeling of existing oil-fired furnaces, and the construction of all forms of furnaces for heating and heat treatment of metals.

If your present liquid fuel equipment is not in every way satisfactory, it can be remodeled to give perfect results. We guarantee entire satisfaction.

To secure 100% economy and 100% efficiency use W. N. Best Oil and Tar Burners for Annealing, Case Hardening, Tempering, Forging, Heat Treating, etc.

W. N. Best High Pressure Burner Unmounted

1. Note the direction of arrows. The air or steam meets the oil at right angles, thus thoroughly atomizing the oil externally, which prevents clogging or carbonizing, the burner always being kept clean.
2. By releasing the set screw in yoke and raising the lip any obstruction that might find its way through the air line can be blown out.
3. Air or dry steam from 15 pounds up can be used to atomize the oil.
4. The burner being in form of a syphon requires but very low oil pressure.
5. Burners can be fitted to throw either a long, narrow flame or a fan-shaped flame 9 feet wide, thus doing away with the necessity of using more than one burner in any fire-box or furnace that is 9 feet or less in width.



High Pressure Burner

W. N. Best Oil Regulating Cock

This regulating cock is provided with a V-shaped, knife-edged opening in the plug, which not only has a shearing action on heavy liquid fuels, but enables the operator to secure the finest possible adjustment.

When a furnace is working continuously on one class of work this cock can be set by the adjusting screw so that when the burner is stopped, it can be returned to the same adjustment when again started.



Oil Regulating Cock

Class "D" Forge Furnace

Designed especially for drop forge work, but can be used for a wide range of heating, welding, tempering, etc. By placing a muffle in the charging space makes an ideal muffle furnace. Made with one or two charging openings.

The consuming fuel unites with the air necessary for perfect combustion in the combustion chamber before it reaches the charging space of the furnace—there is therefore no oxidation of the metal while being heated. The combustion chamber and arch are of such form and proportions that the flame and heat reverberate perfectly upon charging space of the furnace.



Forge Furnace

CALOREX



THE GWYNN ENGINEERING CO.

100-108 LIBERTY AVE.

PITTSBURGH, PA.

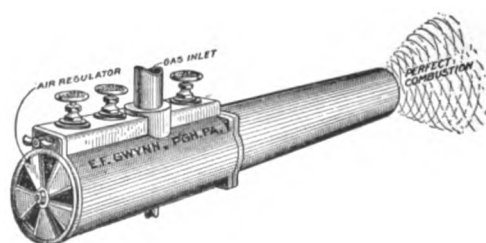
Manufacturers of Gas Burners, Gas Regulators and Oil Burning Equipment

GWYNN GAS BURNERS—For large heating work

The design of GWYNN GAS BURNERS is such that the gas enters the mixing chamber through the side walls of the burner, at an angle to the axis, and forming a converging cone in the center of the burner, through which air cannot pass without coming in contact with the gas. The angle at which the gas inlet holes are drilled puts a spiral or rotary motion on the column of gas and air while passing through the mixing chamber, thereby insuring a perfect mixture before reaching the point of ignition.

This rotary motion keeps the air and gas agitated and mixed until complete combustion takes place.

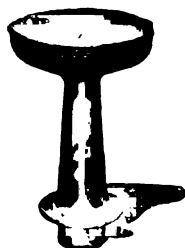
The GWYNN GAS BURNER is made in all sizes and applied successfully to almost every conceivable use.



Boilers	Kettles
Kilns	Lead
	Paint
Furnaces	Varnish
Annealing	Grease
Heat Treating	Composition
etc.	etc.
	House Heating
Ovens	Hot Water
Core	Heaters
Baking	Steam Heaters

Write for Catalog No. 40.

GWYNN GAS BURNERS—For small heating work



Crown Burner

"Gwynn"

Self-Cleaning Gas Burners

The velocity of gas passing through the mixer chamber produces an injector action, drawing in air, the action of air passing through the four air inlets producing a scrubbing and cleaning action on gas orifice.

Send for Catalogue No. 20.

This burner arranged in rows on manifolds provides ideal arrangement and ample heat. The flame is well distributed and easily controlled.

W. S. ROCKWELL COMPANY

50 CHURCH ST., NEW YORK

(Hudson Terminal Bldg.)

Furnace Engineers and Contractors



Continuous Bright Annealing Furnace

COMPLETE INDUSTRIAL FURNACE EQUIPMENT OIL—GAS—COAL

"FURNACE AND FUEL TO SUIT THE WORK"—is the rule governing our consideration of a new or the improvement of existing furnace equipment to suit your needs under your plant conditions. Our purpose is to deal with each case on its individual merits and to recommend changes in methods or equipment only when it is apparent that these will be productive of better results.

We do not merely sell furnaces, but rather means for efficiently producing results in industrial heating operations, which involves a great deal more than combining brick and iron or the burning of fuel.

"ROCKWELL SERVICE" SOLVES HEATING PROBLEMS

We make inspection of plant, devise methods and means of working, prepare plans, furnish complete industrial furnace equipment and guarantee results, using coal, coke, gas or oil, as the best interests of our patrons require.

The following list of furnaces and appliances illustrates the variety of work we do and our familiarity with furnace and fuel problems:

Angle Heating Furnaces
Annealing Furnaces
Billet Heating Furnaces
Blast Gates, New Air-
Tight
Blowers
Carbonizing Furnaces
Cyanide Furnaces
Drying Furnaces
Enameling Furnaces
Forging Furnaces

Fuel Oil Appliances
Hardening Furnaces
Heat-Treating Furnaces
Heating Furnaces
Lead Pot Furnaces
Melting Furnaces
Muffle Furnaces
Plate Heating Furnaces
Rivet Furnaces
Rivet Rod Furnaces

Spring Fitting Furnaces
Soft Metal Melting
Furnaces
Stoker Fired Recupera-
tive Furnaces
Scaling Furnaces
Tempering Furnaces
Upsetting Furnaces
Varnish Boiling Furnaces
Wire Furnaces



Write for
Catalog



Standard Rolling Mill Annealing Furnace

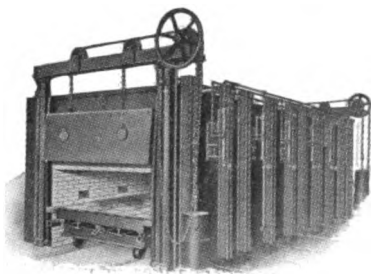


Economizer Forge Furnace

CHARLES F. KENWORTHY, INC.

WATERBURY, CONN.

Builders of Industrial Furnaces



**KENWORTHY
FURNACES
GIVE THE BEST
OF RESULTS**

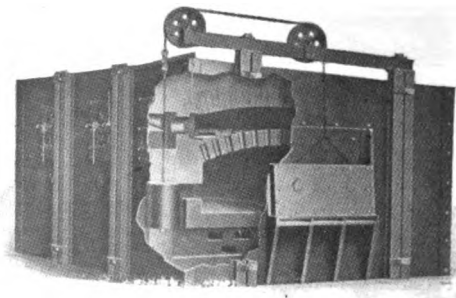
No. 707 CAR TYPE FURNACE

This furnace is very useful for heat treating products of large sectional area and all materials which are not easily charged into a heating chamber by hand.

ASK FOR BULLETIN NO. 81

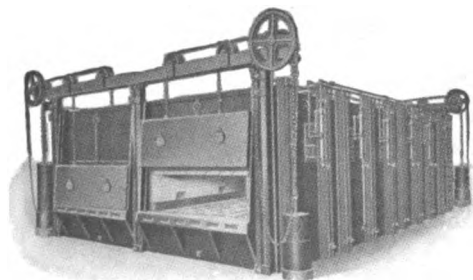
414

**SIZES TO
MEET YOUR
SPECIAL
REQUIREMENTS**



No. 705 HEAT TREATING FURNACE

For all steel annealing, case hardening and heat treating operations.



**INDUSTRIAL
FURNACES OF
EVERY DESCRIPTION
INCLUDING
SHIPBUILDING,
ANGLE OR BAR
HEATING, ETC., ETC.
ASK FOR
BULLETIN NO. 82**

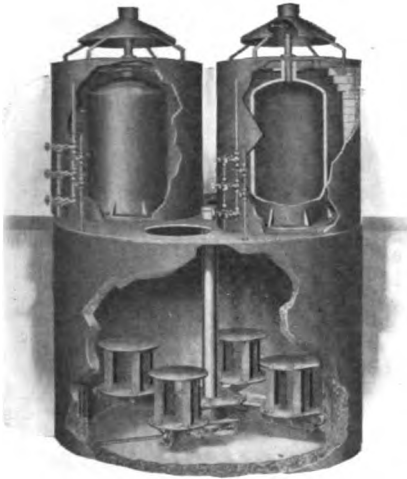
TWIN DOUBLE END ANNEALING FURNACE

For annealing brass, copper and German silver products.

CHARLES F. KENWORTHY, INC.

WATERBURY, CONN.

Builders of Industrial Furnaces



HEAVY DUTY ANNEALING FURNACE

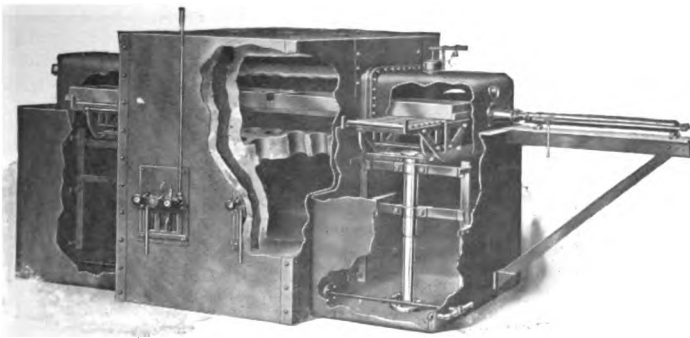
"Bright" Anneals 5000 lbs.
per charge. Vertical type—
built in all sizes with single or
double chamber.

Eliminates useless handling,
pickling or washing of metals.
No protection coating required.

Many other types of non-
oxidizing furnaces.

ASK FOR BULLETIN
No. 83-N

415



NON-OXIDIZING ANNEALING FURNACE—HORIZONTAL TYPE

This furnace is built in a variety of sizes.

ASK FOR BULLETIN NO. 80-N.

TATE-JONES & CO., INC.

Furnace Engineers

PITTSBURGH, PENNA.



Car Type Annealing Furnace
Braeburn Steel Plant, Braeburn, Pa.

OVERFIRED FURNACES

OIL OR GAS FUEL

For Heat Treating, Annealing,
Carbonizing

Accurate and easily controlled temperatures are absolutely essential in these heating operations. Add to these, ease and economy of operation and a large output of perfect work and you have the distinguishing features of the Tate-Jones Overfired Furnaces.

The combustion chamber is above the heating compartment, the heat being forced downward through a perforated arch of high-grade fire brick. The heat is thus evenly distributed and a uniform temperature is accurately controlled by the burners and the dampers and can be maintained indefinitely.

Accuracy of Temperature: Specially designed burners (either oil or gas) insure prompt control. The products of combustion and hot gases pass through the perforations in the combustion chamber and into the heating chamber and spread out horizontally onto the work. Pyrometer readings will show every corner uniformly heated.

The desired heat is maintained by a damper system and when properly adjusted controls the temperature with such accuracy that uniform results can be expected from every heat.

The extremely short time of preparation and for the heating process speeds up the output and saves fuel. The roller bearing sheaves and close counterbalancing of the doors and convenient arrangement of all operating parts, save labor. Walls, hearths and arches are made of best grade fire brick with highest refractory qualities, laid with tight joints. Between the inner lining and outer frame is a course of insulating brick—reducing the loss of radiation to the minimum. Heavy cast iron doors—lined with fire brick and insulating brick; always tight when closed.

These furnaces are made in car type and two types of stationary hearth—all fire brick and fire brick with cast iron bars imbedded in the top. In car type, sand seals on car and door prevent heat loss and keep running gear of car cool.

Write for circular 154-A.

OIL BURNING EQUIPMENT FOR OPEN HEARTH FURNACES

Complete equipment of the highest type for the successful and economical burning of oil fuel.

The **Kirkwood Oil Burner**, swinging type (as illustrated), uses oil and compressed air or steam for atomizing. The ratio between oil and the atomizing agent is scientifically worked out and adjustment made and fixed at the factory so that an efficient fire is always maintained. Necessary valves permit the cutting off of the oil and atomizing agent when necessary. The burner is swung in a holder which permits insertion and removal. Nozzle can be elevated or depressed at will.

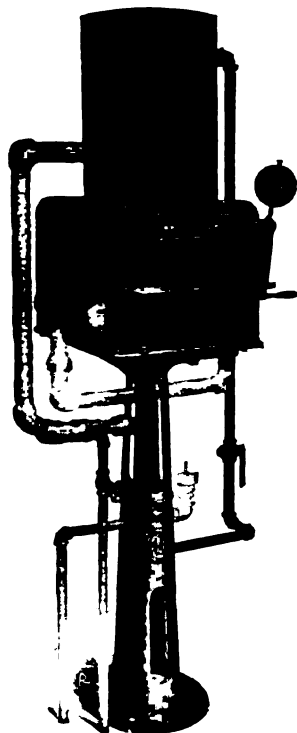
We also supply a water-cooled burner—used where swinging type can not be used.



(Swinging Type)

TATE-JONES & CO., INC.

Furnace Engineers
PITTSBURGH, PENNA.



Series A. For Temperatures
900° to 1600° Fahr.

IMPROVED RECUPERATIVE GAS OVEN FURNACE

For Accurate Temperature Work

900° to 1600° Fahr.

Uses Artificial or Natural Gas

Air Pressure—4 oz. to 2½ Lb.

For hardening carbon steel, preheating or reheating high speed steels. The most scientifically designed line of furnaces and also the most efficient, as actual comparative tests have proven.

The fire brick lining is backed up with 1 inch of special insulating material that is equivalent, in the prevention of heat loss, to 9 inches of fire brick. This effects a big saving in fuel and improves operating conditions.

Because of the design of the interior, 100% of the available radiant and radiated heat is delivered to the work. This is nearly 50% more than other furnaces deliver.

The recuperation device is substantially built and saves fully 25% of the fuel. It is made of cast iron, sheet steel and high grade fire brick. The coil is 1¼" wrought iron pipe, so placed that no direct vent heat strikes it.

Circular 160-A sent on request.

SERIES H FURNACES

For Temperatures 1600° to 2400° Fahr

Use Artificial or Natural Gas

With Air at 1½ to 2½ Lbs. Pressure

The linings are of exceptional quality and efficient, therefore loss by radiation is very small.

The door is built on a slant which tightly engages with the slanting front of the furnace. As the door overlaps top, bottom and sides, and drops into a recess below the shelf level, there is no leakage. Raising the door a fraction of an inch frees it from the front.

Series H Furnaces can be had recuperator type, same as Series A.

Circular 160-A sent on request.

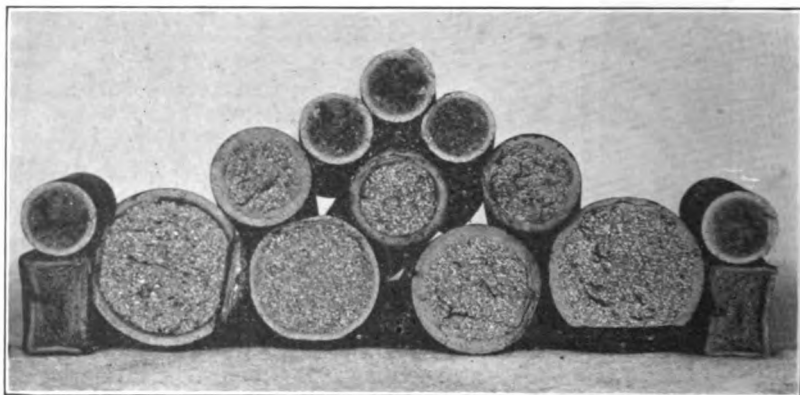
Some Other TATE-JONES Products

Plate and Angle Heating Furnaces, Tool Dressing and Blacksmith Forges, Bolt Heading and Rod Heating Furnaces, Small Forging Furnaces, Heavy and Medium Forging Furnaces, Rivet Forges, Oil Burners for Ceramic Industries, Gas Burners for Furnaces, Lead and Cyanide Pot Furnaces, Tempering Furnaces. Gas or oil burners for boilers. Gas or oil burners for furnaces. Complete oil burning installations.

AMERICAN METAL TREATMENT CO.

ELIZABETH, N. J.

Case Hardening, Annealing, Hardening, Tempering, Coloring, Etc.



Samples of Case Hardening by the Gas Process

Our Specialties:

CASE HARDENING

HARDENING

ANNEALING

TEMPERING

GUN METAL COLORING, ETC.



Fractured Ball Race

We case-harden in bulk parts in the following lines:

Adding Machine Parts

Ball Races

Bushings

Cams

Canning Machine Cams

Gears, Spur Bevel and Worm

Hoisting Engine Parts

Pins and Shafts

Printing Press Parts

Rolls for Various Purposes

Screw Machine Products

Sprockets

Stampings of all kinds

Typewriter Parts

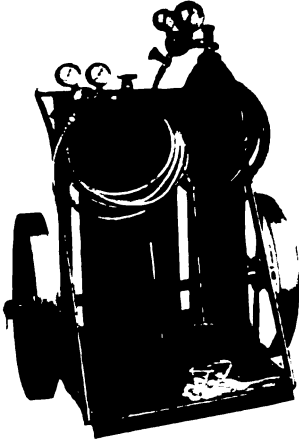
Solid and Hollow Spindles for Screw Machines, Lathes and Grinding Machines, Wrist Pins and Sleeves for Automobile Engines and the largest Stationary Engines.



K-G WELDING & CUTTING CO. INC.

556 WEST 34TH STREET, NEW YORK CITY

'Phone 6358 Greely

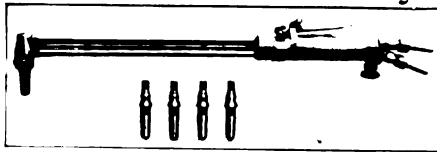


Manufacturers of
OXY-ACETYLENE WELDING
AND CUTTING EQUIPMENT

Contractors
for field and shop, Oxy-Acetylene welding
and cutting of all descriptions.

Oxy-Acetylene Cutting Torch
with 4 tips.

Oxy-Acetylene Welding Torch
with 8 tips.



419

Oxy-Acetylene Manufacturers' Welding Torch with 4 tips.

Oxy-Acetylene Straight Head Welding Torch with 8 tips.

Tips for Cutting Torch, copper.

Tips for Welding Torch.

Tips for Manufacturers' Welding Torch, extra long.

Kerosene Preheating Torches, etc.

Approved by the Underwriters Laboratories of Chicago as a fire and accident risk.

Complete equipment for cutting and welding, or complete equipment for either cutting or welding and all supplies necessary for this line of work. We are also a supply station for oxygen and acetylene. Prices and catalogue and any information furnished on request.

THE ALEXANDER MILBURN CO.

BALTIMORE, U. S. A.

Manufacturers of Portable Carbide Lights and Oxy-Acetylene Welding and Cutting Apparatus

NEW YORK BOSTON CHICAGO PITTSBURGH WASHINGTON, D. C.
51 E. 42nd St. 79 Milk St. 1012 Kimball Bldg. 406 Bessemer Bldg. 711 Thirteenth St., N. W.



PORTABLE CARBIDE LIGHTS

Using Ordinary Carbide

For work at night or in dark places. Used by Engineers, Contractors and Builders; for Sewerage, Waterworks, Road-building; Railroads, Mines, Shipyards.

Automatic in Operation, Economical, Simple. No Over or After Generation; Wind and Storm Proof; Quickly Set Up.

New Milburn Lights are serving Uncle Sam at home and abroad. They're doing their share in speeding up shipbuilding; in making possible effective outdoor work at night.

They use a fuel sold EVERYWHERE—ordinary carbide, in its cheapest and purest form.

From 100 to 25,000 Candle Power.

Send for Bulletin No. 235.

MILBURN OXY-ACETYLENE APPARATUS



"Cut-Weld" Torch

An all-purpose torch with tips for cutting and tips for welding—quickly interchangeable by simply unscrewing the nut.

Strongly, but simply built; get-at-able valves, solid one-piece tips and it *cannot flash back*.

Length, 19 inches. Weight, including 2 Tips, 2¾ lbs.

Milburn Acetylene Generating Plants are used in large and small Industrial Shops where there is a varied demand for Welding and Cutting. We make these Generators in capacities of 50 lbs., 100 lbs., 200 lbs., 300 lbs., and up.

Send for Bulletin No. 335.

OXWELD ACETYLENE COMPANY

NEWARK

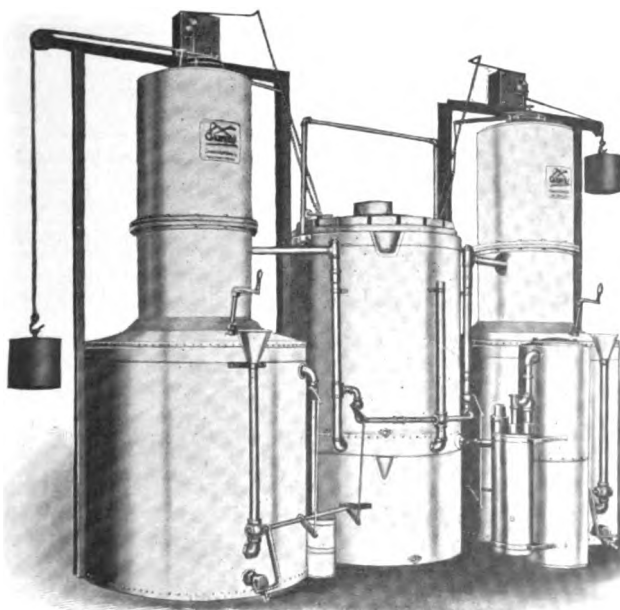
CHICAGO

LOS ANGELES

OXWELD APPARATUS FOR WELDING AND CUTTING METALS WITH THE OXY-ACETYLENE FLAME

Complete plants of all capacities, for utilizing the Oxweld Process most efficiently under every condition, are manufactured by this company and installed under its direction.

Oxweld Generators consist of three types: **Oxweld Low Pressure Generator**, single type, stationary; **Oxweld Low Pressure Duplex Generator**, stationary, with two independent generating units combined with a single gasometer, permitting continuous operation while recharging, double generating capacity for emergency needs, and uninterrupted supply under all circumstances; **Oxweld Portable Pressure Generator** for use in scrap yards, in gas main construction, in street railroad work, in railroad repair yards, and for all other purposes where portability is a consideration.



Oxweld Low Pressure Duplex Generator

Oxweld Injector Type Blowpipes for welding and cutting are distinguished for economy and maintenance of efficiency. By means of syphoning, they utilize a far larger proportion of the gas content of a cylinder than do other types of blowpipe. This principle also gives the Oxweld Blowpipes the important advantage of operating with equal efficiency on various gas pressures. There are 5 sizes of blowpipe handles, and 10 interchangeable welding heads and copper tips, for use with metals of different thicknesses.

QUASI ARC WELDTRODE CO., INC.

107-109 LAFAYETTE ST., NEW YORK CITY

Patentees of the Quasi Arc Process of Electric Welding and Electrodes.

Patented Methods of Welded Ship Construction, Automatic Arc Welding, Etc.

BRANCHES at London, Paris, Genoa, Valencia, Lisbon, Sydney, Melbourne, Adelaide, Johannesburg, etc.

THE QUASI ARC SYSTEM of Electric Welding represents an important advance over the older methods of autogenous welding, such as oxy-acetylene (or other gas), the carbon-arc, or the bare electrode.

Résumé of Advantages:

1. The Quasi Arc process will be found on trial to be the quickest and cheapest method for welding metal joints or plates from $\frac{1}{16}$ " to 2" thick and upward, and to produce a metallurgically sound joint.
2. No expensive or complicated machinery is required, such as is necessary with other systems of electric welding. The Quasi Arc equipment is portable, simple, and relatively inexpensive.
3. Normal current supplied from the mains (either Direct, or Single-Phase Alternating) can be used at a pressure of 100-110 Volts.
4. It is simple and rapid in application; and, as it requires less skill on the part of the operator than other methods of welding, important savings in labor cost can be effected.
5. There is perfect diffusion of the deposited metal into the work, thus producing a complete weld, and the added metal is perfectly sound, homogeneous and free from oxidation and blowholes.
6. No pre-heating of the work is required; and the extremely localized character of the heating that takes place during the welding, prevents the distortion of the metal so common with other methods of welding.
7. The correct welding temperature is automatically governed by the nature of the special electrodes employed, and alloy steels may be deposited as readily as mild steel.
8. Owing to its purity, the metal at the joint is less liable to suffer from corrosion than the surrounding work.
9. The process is particularly adapted to such construction and repair work as must be carried out in position.
10. It is very economical in current consumption.

The Quasi Arc System has been extensively adopted in Shipbuilding, and in the production of Munitions of all kinds, for the welding of seams in shells, bombs, buoys, etc., etc., both by hand and by automatic machines.

Descriptive Booklet and full information supplied on request, and demonstrations will be arranged at our Works by appointment.

WILSON WELDER & METALSCO., INC.

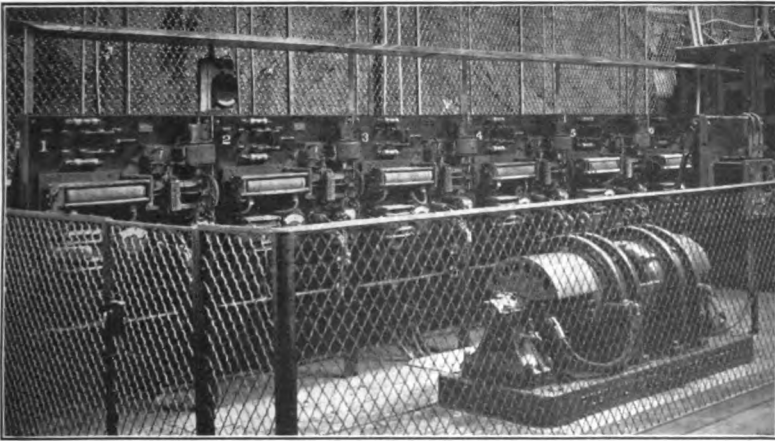
2 RECTOR ST., NEW YORK, U. S. A.

THE WILSON SYSTEM OF ELECTRIC ARC WELDING

in application with

THE WILSON SPECIALLY PREPARED WELDING METALS

Was used on the damaged German Ships taken over by the U. S. Government, to repair the broken and damaged parts of the Machinery and Boilers without regard to form, weight, or original condition.



423

Six Panel or 900 Ampere Installation at the Works of the American Locomotive Company, Dunkirk, N. Y.

THE WILSON ELECTRIC ARC WELDER

PRODUCES PERFECT UNIONS in Cast Iron, Wrought Iron, Cast Steel, Wrought Steel, High Speed Steel, Brass, Copper, Bronze or any weldable metal.

A SAFE AND UNIFORM TEMPERATURE IS MAINTAINED at the point of fusion thus flowing the metals at their respective critical heats.

THE WILSON WELDER SYSTEM requires no preheating nor annealing, and will give higher tensile strength and greater ductility in a clear metal weld than can be obtained by any other method or welding device.

PORTABLE EQUIPMENTS—for one or two operators.

STATIONARY EQUIPMENT—for one, two, or four operators.

The most reliable and economical system on the market as demonstrated by tests.

UNION SPRING AND MFG. CO.

GENERAL OFFICES

1207 FULTON BLDG., PITTSBURGH, PA.

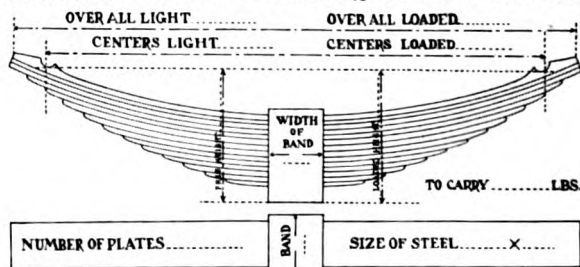
WORKS: NEW KENSINGTON, PA.

BRANCH OFFICES: NEW YORK CHICAGO RICHMOND, VA. LOUISVILLE, KY.
50 Church St. Fisher Bldg. Mutual Bldg. Todd Bldg.

Manufacturers of Coil and Elliptic Springs of All Kinds
Pressed Steel Journal Boxes and Journal Box Lids, Steel Castings

SPECIFICATIONS FOR HALF ELLIPTIC SPRINGS

DIMENSIONS OF..... SPRINGS
FOR..... QUANTITY WANTED.....



SPECIFICATION FOR HELICAL SPRINGS

FOR..... QUANTITY WANTED.....



Place a Cross (X) Opposite Kind of Spring Wanted

Single Coil Spring.....	.....
Double Coil Spring.....	.....
Triple Coil Spring.....	.....
Grouped in Plates.....	.....

NOTE: If grouped in plates, please state the following:

- Free height over plates.....
- Number of Single or Double Coils per group.....
- Enclose sketch or print of plate desired.

	Outside Diameter	Free Height	Size of Bar	Solid Height	Number of Coils	Loaded Height	Load	Capacity Solid
Outer Coil
Middle Coil
Inner Coil

If solid height is not known give number of coils or pitch. These dimensions are equivalent.

KENSINGTON JOURNAL BOX

This box is made of pressed steel conforming to M. C. B. Standard sizes and specifications, as follows:

4 1/4" x 8" 5 1/2" x 10"
5" x 9" 6" x 11"

It is the strongest and lightest box, cannot be broken and absolutely oil tight.



CATALOGUE SECTION
PART V

Compressors, Fans, Blowers
Pumping and Hydraulic Machinery
Crushing and Drying Machinery
Engineering Miscellany

425

Pages 427-508

THE NORWALK IRON WORKS CO.

SO. NORWALK, CONN.

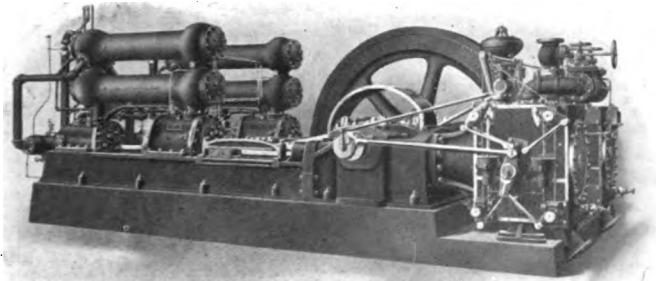
Builders of Air and Gas Compressors for All Classes of Service

NORWALK AIR AND GAS COMPRESSORS

Single- and Multi-stage Compressors, steam, belt, or motor driven.

A standard line of Single- and Two-stage Compressors for general shop use.

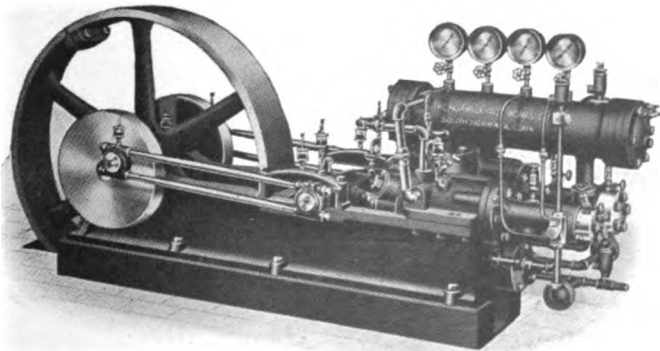
Automatic Proportional Unloaders, which regulate the air delivery to suit the demand.



**Three-stage, TWIN-DUPLEX Compressor with Simple Corliss Steam Cylinders,
Suitable for Compressing Air or Gas up to 2000 Lbs. Pressure**

We build a standard line of Three- and Four-stage Compressors, steam, belt, or motor driven, for compressing air or any of the commercial gases up to 7500 pounds per square inch.

The cut below shows a small Four-stage Compressor as built for Oxygen or Hydrogen to 5000 lbs. This type is extensively used for Liquefying Air, etc.



If you have any special compressing problems, submit them to us. Our long experience in this field enables us to meet the most difficult conditions.

Catalogs and full information on request.

INGERSOLL-RAND COMPANY

11 BROADWAY, NEW YORK, U. S. A.

Offices in All Principal Cities of the World

Builders of Air and Gas Compressors, Blowers, Pneumatic Hammers, Pneumatic Drills, Air Motor Hoists, Air Motors, Pneumatic Sand Rammers, Air Lift Pumps, Air Power Machinery of All Kinds, Vacuum Pumps, Condensers

PRINCIPAL PRODUCTS

AIR COMPRESSORS	JACKHAMER DRILLS
AIR HOISTS	JAM RIVETERS
AIR LIFT PUMPING SYSTEMS	PNEUMATIC TOOLS
AIR DRILLS	PNEUMATIC DRILLS
CAMERON PUMPS	PORTABLE AIR COMPRESSORS
CORE DRILLS	RIVETING HAMMERS
CENTRIFUGAL PUMPS	RIVET FORGES
CHANNELERS	ROCK DRILLS
CHIPPING HAMMERS	STEAM PUMPS
COAL PUNCHERS	SAND RAMMERS
COAL SHEARING MACHINES	STONE CHANNELERS
CONDENSING PLANTS	STONE TOOLS
CUPOLA BLOWERS	SUBMARINE DRILLS
DRIFT BOLT DRIVERS	TIE PEELING OUTFITS
DRILL STEEL	TIE TAMPING OUTFITS
DRILL SHARPENERS	TURBO BLOWERS
ELECTRIC-AIR ROCK DRILLS	TURBO COMPRESSORS
GAS COMPRESSORS	TURBO EXHAUSTERS
HAMMER DRILLS	VACUUM PUMPS
HOISTS, PNEUMATIC	WAGON DRILLS
HOISTS, PORTABLE	WOOD BORERS

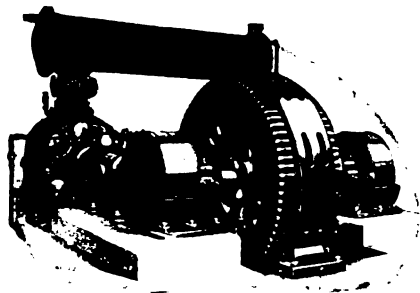
Known by the Following Trade Names

"BUTTERFLY" ROCK DRILLS	"JACKHAMER" ROCK DRILLS
"BEYER" BAROMETRIC CONDENSERS	"JACKSTOPER" ROCK DRILLS
"CALYX" CORE DRILLS	"LEYNER-INGERSOLL" ROCK DRILLS
"CAMERON" PUMPS	"LEYNER" DRILL SHARPENERS
"CROWN" PNEUMATIC TOOLS	"LEYNER" OIL FURNACES
"ELECTRIC-AIR" ROCK DRILLS	"LITTLE DAVID" PNEUMATIC TOOLS
"GASOLINE-AIR" ROCK DRILLS	"LITTLE TUGGER" PORTABLE HOISTS
"I-R" DRILL STEEL	"RADIALAXE" COAL CUTTERS
"IMPERIAL" PNEUMATIC TOOLS	"STOPEHAMER" ROCK DRILLS
"IMPERIAL" AIR COMPRESSORS AND VACUUM PUMPS	
"INGERSOLL-RAND" AIR COMPRESSORS AND VACUUM PUMPS	

Catalogues covering any of these products furnished upon request.

INGERSOLL-RAND COMPANY

"INGERSOLL-RAND" AND "IMPERIAL" AIR COMPRESSORS



"Ingersoll-Rand" Class "PRE"

The company builds types of compressors for every service, for all pressures to 2500 pounds and in all capacities to 10,000 cu. ft. per minute.

These machines are characterized by simplicity of design, reliability, efficiency and silence of operation. All are automatically lubricated, thoroughly water jacketed and compound machines are provided with effective intercoolers.

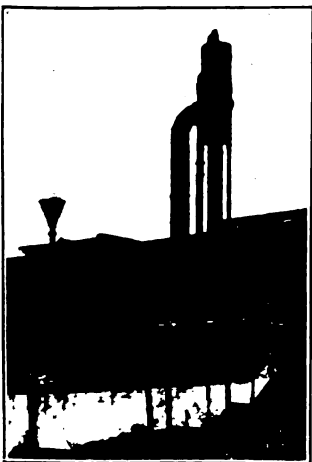
Compressors are to be had for belt, rope, gear or silent chain drive or may be had as short belt or direct-connected electric motor, balanced piston valve or Corliss valve steam engine driven units.

Bulletins describing any or all types gladly furnished.

"INGERSOLL-RAND" AND "IMPERIAL" DRY VACUUM PUMPS

Embody the same desirable features of design as the air compressor line. They are high speed machines of large capacity per unit of floor space. They will maintain any desired degree of vacuum (within .5 in. of barometer) consistently and at low cost.

Bulletins 3037 and 3038.



I-R TURBO BLOWERS AND COMPRESSORS

Are built for blast furnace, converter, cupola and similar low pressure service and for all industrial high pressure requirements. Blower capacities from 3000 to 60,000 cu. ft. Compressor capacities from 3500 to 12,000 cu. ft. Pressures from 1 to 100 lbs.

Full information on request.

I-R STEAM CONDENSING PLANTS

of the Beyer Barometric type are to be had for all service conditions. They are highly efficient and very economical to operate.

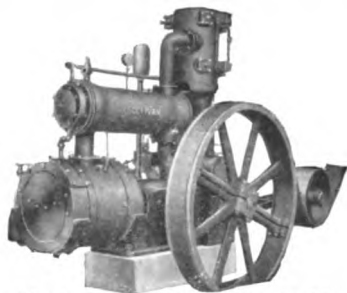
Bulletin 9024.

SULLIVAN MACHINERY COMPANY

121 SO. MICHIGAN AVE., CHICAGO

30 CHURCH ST., NEW YORK

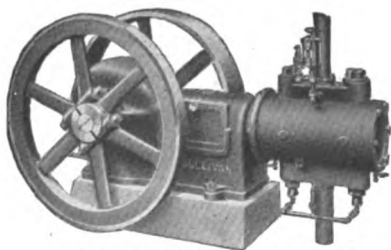
Sullivan Air Compressors, Air Lift Pumps, Rock Drills, Channelers, Hammer Drills, Drill Sharpeners, Coal Mining Machines, Quarrying Machinery, Diamond Core Drills, Core Drilling Contracts



"Angle Compound." Bulletin 75-CS



Tandem Corliss. Bulletin 75-FS



Belted, Single Stage. Bulletin 75-AS

AIR COMPRESSORS

ANGLE-COMPOUND power driven compressors are economical of floor space and secure efficiency through exact balancing of reciprocating parts. For belt or direct connection, single or twin units, 400-2600 cu. ft., equipped with **END-ROLLING FINGER VALVES**.

TANDEM CORLISS compressors secure high fuel economy and save floor and foundation cost. Built in units 1000 to 3150 cu. ft.

"WG-3" **SPLASH-OILED**, SINGLE STAGE compressors provide "a little air all the time." Capacities, 50-300 cu. ft. Equipped with radial air valves and inlet unloader; for steady, reliable service.

SULLIVAN AIR LIFT PUMPS

Secure:

1. **More water** from the same wells than by other means.
2. **Cooler water**, which means a saving in horse-power, in condensing, ice-making, etc.
3. **Purer and "softer"** water, due to aeration.
4. **Greater simplicity** and reliability. There are no moving parts in the well.
5. **The apparatus** is always in working order; not affected by mud or sand.
6. **Efficiency** kept up to original point at all times and after long use.
7. A scattered group of wells can be pumped as readily as one well.
8. **Acid and chemical solutions** handled efficiently.

Sullivan Air Lift Engineers have studied water supply problems for 25 years. Their advice is free. Ask for details of systems we have installed for towns and factories throughout the country.

Bulletin No. 71CS



WORTHINGTON PUMP AND MACHINERY CORPORATION

115 BROADWAY, NEW YORK

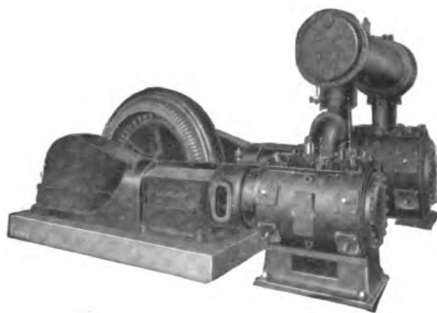
LAIDLAW WORKS: CINCINNATI, OHIO

Branch Offices in All Principal Cities

Laidlaw Feather Valve Air Compressors, Vacuum Pumps, High Duty Pumping Engines

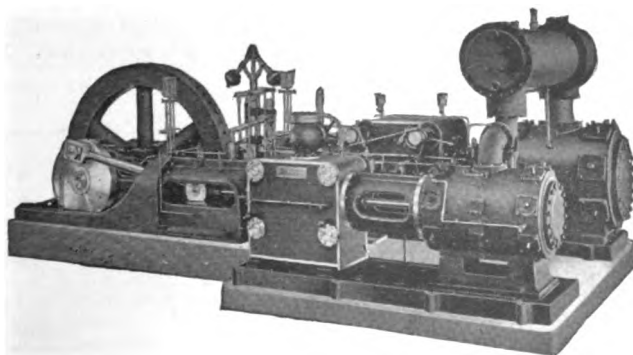
MOTOR DRIVEN COMPRESSORS

Laidlaw Feather Valve Power-Driven Compressors are driven by either direct-connected engine type motor, or by belt or rope drive. The unique feature of these machines is found in the use of the Laidlaw Feather Valve; efficiency, durability and noiseless operation are thus secured. Laidlaw Power-Driven Compressors are either single-, two-stage or multi-stage. They are built for any working pressure up to 3500 lbs. per sq. in.



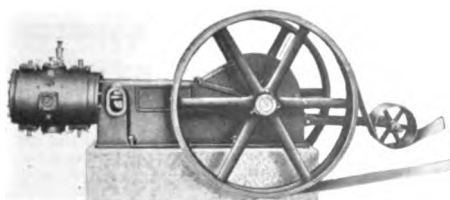
HEAVY DUTY CORLISS COMPRESSORS

Where a large capacity is needed, Laidlaw Steam-Driven Compressors are made with full releasing, automatic Corliss steam gear, embodying every refinement and improvement found in the best Corliss power engine. The compressor end is identical with that used on power-driven compressors.



Corliss Feather Valve Compressor

SMALL LAIDLAW COMPRESSORS



Single-Stage Belt-Driven Feather Valve Compressor

The same refinement of detail, and the same rugged construction, which characterize the larger Laidlaw Air Compressors are found in the smaller ones. Single-belt and steam-driven compressors are built in capacities ranging from 100 cu. ft. per min. and for pressures ranging from 30 to 100 lbs. per sq. in.

L 269.8

WESTINGHOUSE TRACTION BRAKE COMPANY

FACTORIES: WILMERDING, PA., AND MILWAUKEE, WIS.

Atlanta, Ga.
Boston, Mass.
Chicago, Ill.
Columbus, O.

Denver, Col.
Houston, Tex.
Los Angeles, Cal.

Mexico City
New York, N. Y.
Pittsburgh, Pa.

San Francisco
Seattle, Wash.
St. Louis, Mo.
St. Paul, Minn.

**Manufacturers of Westinghouse and National
Steam-, Motor- and Belt-Driven Air Compressors and Accessories**

SPECIFICATIONS



Pair of Westinghouse 10½-inch, Steam-Driven, Automatically Governed Air Compressors, McGraw-Hill Publishing Company, New York City

Diameter of high pressure steam cylinder, 10½"; low steam, 16¾"; high air, 9¾"; low air, 14¾"; stroke, 12". Steam admission pipe, 1½"; steam exhaust, 2½"; air admission, 2½"; air delivery, 1½". Designed for steam pressure of 100 lbs. working against 80 lbs. air pressure. Makes 131 strokes and has displacement of 150 cu. ft. per min. Height, 52"; width, 42"; depth, 21"; weight, 1800 lbs.

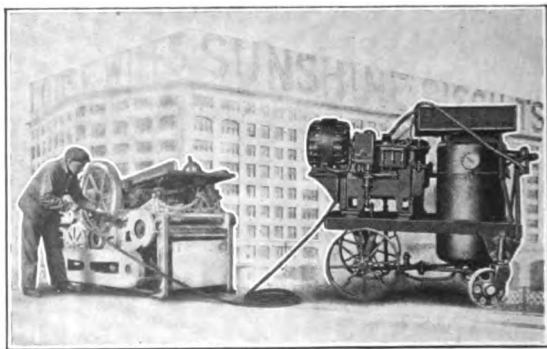
See Publication No. 9012.

432

The 10½" Cross Compound Air Compressor is a development of the railway locomotive air brake type to suit contracting and industrial service. Embodies extreme simplicity in design, absolute reliability in action, durability and low maintenance expense. Is rugged, compact and of neat appearance. Suited for wide range of industrial purposes.

SPECIFICATIONS

Piston displacement, 11.4 cu. ft. per min.; cylinder, 5" x 2½"; crank shaft R. P. M., 202; H. P. at 90 lbs. pressure, 1.75; motor R. P. M., 1400; suction pipe, 1"; discharge pipe, ¾"; length, 33½"; width, 20½"; height, 21¼"; weight, 775 lbs. Other sizes up to 57 cu. ft. displacement, 10 H. P. at 90 lbs. pressure and 1700 lbs. weight, with corresponding increased dimensions, etc.

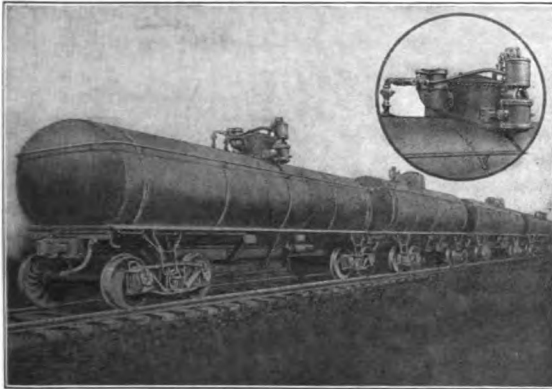


Send for Publication No. 400.

National H-1 Portable Air Compressor Outfit Used in the Loose-Wiles Sunshine Biscuit Plant at Long Island City, N. Y.

The National H-1 Portable Air Compressor Outfit is ideally adapted for use in mercantile establishments, manufacturing plants and in construction work. It is easily hauled from place to place. Is always available for instant use. Motor, compressor and steel reservoir, together with accessories, are mounted on a specially built truck with steel wheels and axles.

WESTINGHOUSE TRACTION BRAKE COMPANY



SPECIFICATIONS

Displacement of compressor 92 cubic feet per minute. Dimensions, $9\frac{1}{2}$ x 13 x 10 inches. Weight, approximately 800 lbs. Other sizes up to 150 cubic feet per minute.

Send for Publication No. 9012.

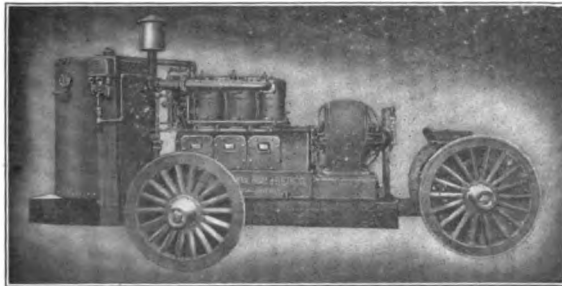
Westinghouse Air Compressors permanently installed on tank cars to agitate steam-heated asphalt and to expel it from tank by the Barber Asphalt Company, Maurer, N. J.

The Westinghouse Single Stage and Cross Compound Steam Driven Compressors are specially adapted and are used for agitating and ejecting oils and liquid asphalt in tank cars, because of their light weight, small amount of space taken up and absolute reliability. They are also employed as vacuum pumps for removing oils from tank cars by the suction process.

SPECIFICATIONS

Piston displacement at 90 lbs. pressure, 150 cu. ft. per min.; cylinders, $8\frac{1}{2}$ " x 9"; crank shaft R. P. M., 170; H. P. at 90 lbs. pressure, 27; suction pipe, $2\frac{1}{2}$ "; discharge pipe, $2\frac{1}{2}$ "; water cooling pipe, $\frac{3}{4}$ "; length, 93"; width, 33"; height, $50\frac{1}{4}$ "; weight, 6200 lbs.

Send for Publication No. 401.



National Portable 3VS Air Compressor, motor-driven, automatic-control, used by Smith, Hauser & MacIsaacs, Contractors, New York City, to operate rock drills and steel construction in new subway work

The National 3VS Compressor is ruggedly and compactly built in both stationary and portable units, self-contained, electrically driven, automatically controlled, and requires very little attention after once installed. Cylinders and cylinder heads are completely water-jacketed. Designed for continuous service against 90 lbs. pressure. Herringbone pinion and gear. Complete automatic controlling devices permit starting of direct current compressors with not to exceed one-half full load current, and alternating current compressors with not to exceed full load current. Three vertical cylinders and 120 degree spacings of crank shaft assures quiet and smooth operation.



AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN

Manufacturers of Heating, Ventilating, Cooling, Purifying, Humidifying, Drying, Mechanical Draft and Blast Equipment; Vertical Self-Oiling Steam Engines, Steam Traps; Fans and Blowers for All Purposes



Fig. 1

"Sirocco"
TRADE MARK

SYSTEM OF PURIFYING, COOLING AND HUMIDIFYING

For Purifying and Humidifying air in Schools, other Public and Semi-Public Buildings.

For Humidifying and Cooling air in Textile Mills, Macaroni Drying Plants, Printing Houses, and other industrial plants.

For Dehumidifying and Cooling in Candy Factories, Bakeries, Photo Film Drying Rooms, Blast Furnaces, Electric Generators, etc.

Capacities from 3,500 C. F. M. to 350,000 C. F. M.

Write for "detail" information.

Fig. 1 shows "Sirocco" Air Purifier, Cooler and Humidifier.

MULTI-BLADE FANS AND BLOWERS

For Heating, Ventilating and Cooling in Public, Office, Industrial and Educational Buildings.

For Drying and Mechanical Draft.

Sirocco Multi-Blade Fans will handle more air consuming less power than the ordinary steel plate fan, having twice the wheel diameter.

Built with capacities of from 75 C. F. M. to 1,000,000 C. F. M.

Complete specifying information at your request.

Fig. 2 shows "Sirocco" Multi-Blade Fan for Pulley, Motor or Engine Drive.

Fig. 3 shows "Sirocco" Multi-Blade Fan Wheel.



Fig. 2



Fig. 3

"ABC" EXHAUST FANS FOR EXHAUSTING AND CONVEYING SYSTEMS

Exhaust shavings, dust and refuse from wood-working plants.

Take away the dust from emery grinders, buffing and polishing wheels.

Remove smoke and gases from forge fires.

Exhaust the dust from cement plants, flour mills and similar plants.

Remove steam and vapor from vats and kettles in breweries, packing houses, textile and rubber factories.

Elevate and convey cotton and wool in textile mills.

There is a size and type to meet any requirement.

Capacity tables and complete data sent on request.

Fig. 4 shows Type "E" Fan for pulley drive. This and other types are furnished also with direct connected motors.



Fig. 4

TYPE "P" SPECIAL STEEL PRESSURE BLOWERS FOR FURNACE AND CUPOLA SERVICE

For supplying draft to Oil and Gas Furnaces; Cupolas; Sintering, Smelting and Pulverized Coal Machines.

For blowing scale from dies in drop forge plants.

Bearings being on independent foundations preclude vibration in the housings. Built to discharge at any angle, against pressures from 1 to 24 ounces.

Ask for complete working data.

Fig. 5 shows Type "P" Special Steel Pressure Blower.



Fig. 5

AMERICAN BLOWER COMPANY

BRANCH OFFICES

ATLANTA, BOSTON, CHARLOTTE, N. C., CHICAGO, CLEVELAND, COLUMBUS, O., DALLAS, DENVER, DES MOINES, EL PASO, TEX., GRAND RAPIDS, MICH., INDIANAPOLIS, KANSAS CITY, LOS ANGELES, MINNEAPOLIS, NEW ORLEANS, LA., NEW YORK, PHILADELPHIA, PITTSBURGH, ROCHESTER, SAN FRANCISCO, SALT LAKE CITY, SEATTLE, ST. LOUIS, with works at Troy, N. Y., and CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO.



"ABC" VERTICAL, SELF-OILING STEAM ENGINES

Type "A"—Single Cylinder—Engines develop up to 60 H. P. For school or other work where steam pressure is limited to 30 pounds—advocate Type "A" Low Pressure Engines, develop up to 40 H. P.

Type "E"—Double Cylinder—Engines develop up to 120 H. P. This engine is advantageous where more than 40 H. P. and fairly high rotative speed are required and only small space available.

Type "X"—Compound—Engines develop up to 120 H. P. This compound engine is a very conservative steam consumer for H. P. developed. Same space requirements as for Type "E."

Complete information on all types at your request.

Fig. 6 shows "ABC" Engine direct-connected to dynamo for generating electric current.

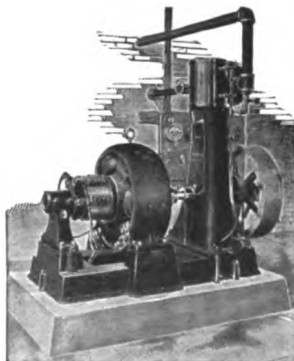


Fig. 6

"DETROIT" AUTOMATIC STEAM TRAP SYSTEMS

Return, Non-Return, Vacuum, Metering, Lifting and Combination

For all steam systems under all pressures.

The hot condensation is returned direct to the boiler automatically—at a temperature nearly equal to that at which it is condensed.

A few applications—Lumber Dry Kilns; Brick Tunnels; Vacuum Pans; Steam Cooking Kettles; Laundry, Veneer and Paper Machines (Heating Systems—Gravity Return—Vacuum); Vulcanizers; Hot Rolls, etc.

Any condensation handling problem can be economically solved by the use of "Detroit" Traps.

Let us send you full data.

Fig. 7 shows "Detroit" Automatic Return Trap.



Fig. 7

TYPE "V" UNIVERSAL BLOWERS AND EXHAUSTERS

Four angles of discharge right-hand drive and four angles of discharge left-hand drive can be made from one Type "V" Universal Fan (aside from various angular discharges). For all Blowing and Exhausting work requiring up to four ounces pressure. Built for either pulley or motor drive.

Write for latest Bulletin.

Fig. 8 shows Type "V" Bottom Horizontal, Right-Hand Universal Fan. Pulley drive.



Fig. 8

"VENTURA" DISC VENTILATING FAN

For delivering large volumes of air at low pressure or against small resistances.

Low price—Small power consumption and inexpensive to install.

For ventilating rooms and buildings—Ventura, motor driven, ventilating fans 650 C. F. M. to 17,500 C. F. M.

For ventilating small mines or at any mine where a disc fan can be used—engine or motor driven—from 12,000 C. F. M. to 100,000 C. F. M. resistance not to exceed 1" W. G.

Write for complete information.

Fig. 9 shows Ventura motor driven ventilating fan.



Fig. 9

STERLING BLOWER COMPANY

HARTFORD, CONN.

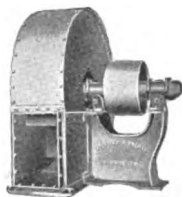
BRANCHES—NEW YORK—BOSTON—ROCHESTER

We Manufacture and Install Complete Systems for Handling Shavings, Dusts, Lints, Odors, Etc., Also Ventilating Systems

SPECIAL FANS AND BLOWERS

BUILT ON SPECIFICATION, FOR ALL PURPOSES

STERLING, SLOW SPEED, LOW POWER EXHAUSTERS



These Exhausters are the most efficient for handling any material which can be conveyed by a current of air through pipes. They are especially designed to give the best results with a minimum consumption of power and least vibration. The shafts are forged and ground to size. The bearings are double ring oilers, self-aligning, and are supported on a well proportioned cast iron standard.

STERLING VOLUME TYPE FANS



Volume Type Fans are built both top and bottom Horizontal discharge.

Sides are interchangeable, making either right or left hand.

STERLING DUST SEPARATORS



Are highest in EFFICIENCY, CONSTRUCTION and DURABILITY; for separating dust and other light materials from a current of air discharged from an Exhauster handling these materials. The material is quietly emitted from the opening at the bottom, while the purified air passes out through the top of the separator.

Of best proportion for high efficiency and of proper construction to withstand the wear and exposure to which they are usually subjected, they have won the preference of the engineering profession throughout the world.



STERLING DUST ARRESTER

Used in installations where material is so light that it cannot be separated from the air by centrifugal force—the only satisfactory method of handling dust from tumbling barrels—cement plants—potteries, etc.

WILBRAHAM-GREEN BLOWER CO.

POTTSTOWN, PA.

Sole Manufacturers of Green Patented Rotary Positive Pressure Blowers, Gas Exhausters and Huntoon Patented Gas Governors



Pulley Driven Blower

ROTARY POSITIVE PRESSURE BLOWERS, GAS EXHAUSTERS AND VACUUM PUMPS

Known as "THE OLD RELIABLE"

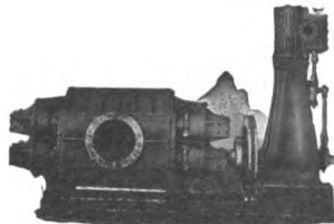
437

Our Blowers and Exhausters are in use in all parts of the United States and many in Foreign Countries. The Wilbrahams began business in Philadelphia in 1854, and the Rotary Positive Pressure Blower built by them took the first prize at the Centennial in Philadelphia in 1876, and in 1915 this same Blower was still giving excellent service in a foundry in Connecticut, since we have not heard from it.

If you desire to deliver air or gas against pressures from 1 to 5 lbs. for any purpose whatever, we believe it will be to your advantage to allow us to quote you.



Motor Driven Blower



Engine Driven Exhauster

THE ALDRICH PUMP CO.

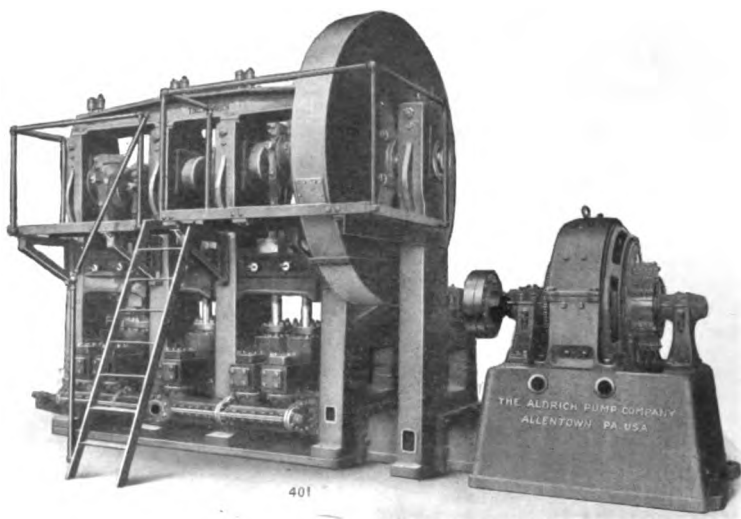
ALLENTOWN, PA., U. S. A.

PITTSBURGH, PA., 1314 KESNAN BLDG.

CHICAGO, ILL., 1936 McCORMICK BLDG.

"Aldrich" Vertical and Horizontal Pumps, Triple and Quintuplex Types, Electric and Power Drive, for Hydraulic Plants, Mines, Water Works and General Service

ALDRICH PRESSURE PUMPS



Above cut illustrates a typical Aldrich Quintuplex Pressure Pump as used for munitions service. Pump shown has a capacity of 150 gallons per minute at 2500 pounds pressure per square inch. The particular features are its five single-acting plungers, producing an almost even flow, a most desirable condition in any hydraulic plant and especially where very high pressures are employed. Pump is direct geared through double helical gearing and flexible coupling, to a variable speed motor. A Mechanical Unloading Device in the suction pipe allows pump to run continuously and deliver only when system demands. Control is by rise and fall of Accumulator. This feature also permits usage of a Synchronous Motor whereby power factor can be raised. Pump Data 29, sent upon request, deals particularly with our line of Pressure Pumps, Accumulators and other Hydraulic Machinery.

We also make a specialty of Electric Pumps for Mines, Mills, Water Works and general pumping requirements.

SEND FOR OUR PRINTED MATTER.

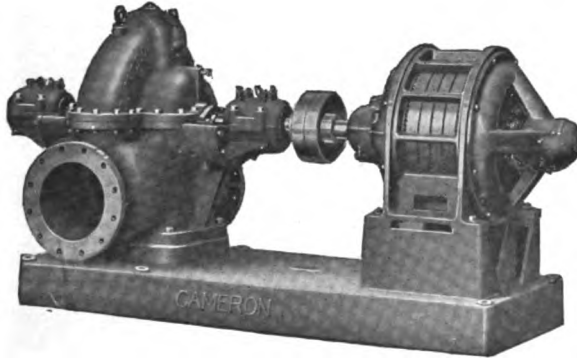
A. S. CAMERON STEAM PUMP WORKS

11 BROADWAY, NEW YORK

Offices in All Principal Cities of the World

Designers and Builders of Centrifugal Electric Pumps; Piston and Plunger Simplex Steam Pumps for All Classes of Service

CAMERON DOUBLE SUCTION VOLUTE PUMP



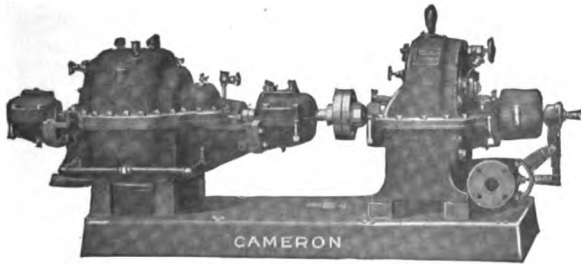
Cameron Centrifugal Pumps are the most modern in design, and have proved highly efficient and economical.

The Double Suction Volute Pump is especially adapted for general service. The casing is horizontally split, allowing quick, easy access to all working parts. The impeller is enclosed, and perfectly balanced. Built for capacities from 50 to 15000 G. P. M., for heads from 10 to 200 feet. Can be direct-connected to electric motor, steam turbine or other forms of power drive.

439

Bulletin No. 7150

CAMERON MULTI-STAGE TURBINE PUMP



The Cameron Multi-Stage Turbine Centrifugal Pump is simple and compact, strong and dependable. All parts accessible by means of the horizontally split casing.

This pump gives an exceptionally high efficiency over a wide range of capacity. The cost of upkeep is very low.

It is built in two, three and four stages for a wide variation of speed and capacities from 75 G. P. M. to 2500 G. P. M., against heads from 120 to 800 feet. The drive may be steam turbine or any available motive power.

Bulletin No. 7251

CAMERON STEAM PUMPS are adapted to all classes of service. They have fewer working parts than any other steam pump, and none exposed. Only four pieces in the Steam Mechanism. By merely removing the valve chest cover on the water end the whole interior of the valve chamber is plainly visible.

All the way through it is compactly and ruggedly constructed.

Bulletin No. 7104

THE DEMING COMPANY

SALEM, OHIO, U. S. A.

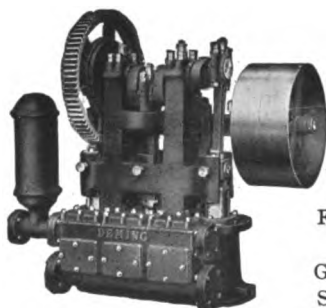
NEW YORK OFFICE AND STOCK: 152 Chambers Street

Manufacturers of Hand and Power Pumps for All Uses

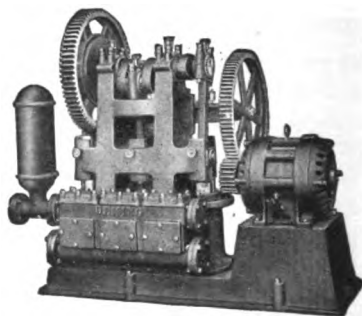
DEMING POWER PUMPS

DEMING Power Pumps are made in such a variety of styles and sizes that their range of application is practically unlimited where belts, water wheels, electric motors, or steam, gas or gasoline engines are available sources of power. The types include Single- and Double-Acting Triplex Pumps for various services, Deep Well Power Working Heads, Artesian Well Cylinders, Rotary and Centrifugal Pumps. They are all built upon such lines as to insure great durability, efficiency, reliability, ease of operation and low cost of maintenance.

Deming Single-Acting Triplex Plunger Pump



Size 7x8 to 8 1/2x8



Size 5 1/2x8 with Type "B" Drive

Fig. 50
for
General
Service

Fig. 50 Single-Acting Triplex Pump is designed for water works, hydraulic elevator service, boiler feed, pulp grinders and general water supply.

Deming Triplex Pumps embody the principle of the three-throw crank shaft, with the crank pins at an angle of 120 degrees with each other, by which arrangement the strokes follow and overlap one another. This results in a continuous and uniform action upon the fluid being pumped, and insures an easy flow through the delivery pipe, with a corresponding high degree of efficiency in the operation of the pump.

All of our triplex pumps, whether of low service, medium or heavy pressure types, have the plungers with crossheads outside guided, thereby relieving the stuffing-box glands of lateral pressure due to the side thrust of the connecting rods.

FIG. 50. STANDARD SIZES, CAPACITIES, ETC.

PLUNGERS				DIAM. OF PIPES				PLUNGERS				DIAM. OF PIPES			
Diam. In.	Stroke In.	CAPACITY Gallons Per Hr.	Max. Working Pressure Lbs.	Suction In.	Discharge In.	Diam. In.	Stroke In.	CAPACITY Gallons Per Hr.	Max. Working Pressure Lbs.	Suction In.	Discharge In.	Diam. In.	Stroke In.	CAPACITY Gallons Per Hr.	Max. Working Pressure Lbs.
2	2	340	150	1 1/2	1	6	8	9660	140	4	3	10	10	24800	160
2 1/4	2	532	150	1 1/2	1	7	8	13400	150	5	4	11	10	27600	150
2 1/2	3	684	150	2	1 1/4	8	8	17240	150	5	4	12	12	37400	160
3	3	972	150	2	1 1/4	8 1/2	8	19460	140	6	5	12	12	44400	150
3 1/2	3	1320	150	2	1 1/2	9	10	24800	160	8	6	12	14	49200	150
3 1/2	4	1800	150	2 1/2	2	10	10	27600	150	8	6	13	14	58000	140
4	4	2340	150	2 1/2	2	11	12	37400	160	10	8				
4	6	3540	160	2 1/2	2	12	12	44400	150	10	8				
4 1/2	6	4440	150	3	2 1/2	12	14	49200	150	12	10				
5	6	5460	150	3	2 1/2	13	14	58000	140	12	10				
5 1/2	8	8840	150	4	3										

Complete 192-page Power Pump Catalogue Mailed to Engineers on Application.

EPPING-CARPENTER PUMP CO.

MAIN OFFICE AND FACTORY

PITTSBURGH, PENNA.

Sales Offices or Agencies in all Principal Cities

Manufacturers of Pumping Machinery and Condensers

EPPING-CARPENTER manufactures direct acting pumps fitted with simple, compound, and triple expansion piston valve steam ends.

Simple, Compound, and Triple Steam Ends can be equipped with our balanced piston valve and adjustable valve gear, if specified.

WATER ENDS—Our Pumps are fitted with Outside End Packed, Pot Type Water ends, as illustrated by Cut 622, also Outside Center Packed Plunger type, and piston Packed Type Water ends.

For **WATER WORKS SERVICE** we manufacture Triple Expansion Pumping Engines, as illustrated by Cut 600, Corliss Cross Compound Pumping Engines, as shown on Cut 727, and Meyer Gear Pumping Engines.

For **HYDRAULIC SERVICE** we offer High Efficiency Power Pumps, equipped with Herringbone Gears, and fitted with water ends as illustrated in Cut 766.

CENTRIFUGAL PUMPS—We manufacture Volute and Multi Stage Centrifugal Pumps, either for belt, motor or steam turbine drive.

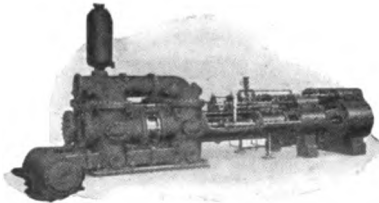
For **OIL LINE PUMPS**—We offer Triple Expansion, Corliss and Power Pump types, complete in every detail, which have given exceptional service.

We have manufactured Pumping Machinery exclusively for FIFTY-TWO YEARS, and invite Engineers to send their inquiries. We are pleased to furnish full information in reference to our products, upon application.

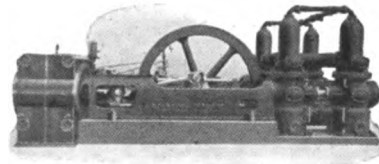
OVER 16,300 PUMPS IN SERVICE FIFTY-TWO YEARS IN BUSINESS



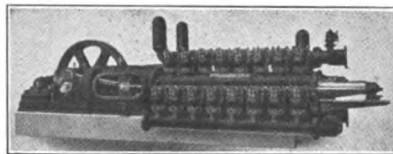
Cut No. 622
Outside End Packed Pot Type Pump



Cut No. 600
Triple Expansion Center Packed Pump



Cut No. 727
Corliss Cross Compound Pumping Engines



Cut No. 766
High Efficiency Power Pump

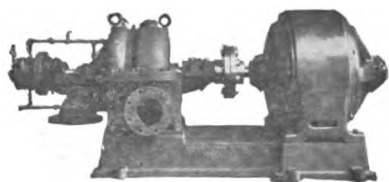
MORRIS MACHINE WORKS

BALDWINVILLE, N. Y.

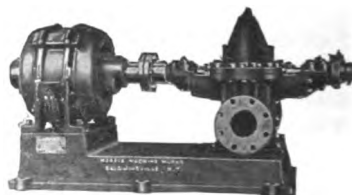
Branch Offices in Principal Cities

Builders of Centrifugal Pumping Machinery, Hydraulic Dredges, Stationary and Marine Engines

We build CENTRIFUGAL PUMPS for almost any service and of all types including side suction and double suction, vertical or horizontal shaft. STAGE PUMPS for high heads. TWIN PUMPS for large capacities and high speeds. Or will design SPECIAL PUMPS to suit special conditions. As the oldest and largest firm in the country building exclusively this class of machinery, our experience of over fifty years has covered all services for which Centrifugal Pumps have been used.



Horizontally Split Multi-Stage Pump



Horizontally Split Single-Stage Pump

MORRIS CENTRIFUGAL PUMPS

are perfectly balanced, require small space and foundation; have high efficiency; are equally suitable for from small up to very large capacities, and can handle sand or solids with the water without injury. These pumps direct connected to reciprocating engines are suitable for moderate heads, or direct connected to electric motor or steam turbine (or belt driven) for high heads. For heads above 100 feet, pumps are preferably built in stages.

The SINGLE- and MULTI-STAGE horizontally split pumps, illustrated, are built to meet the demand for a pump capable of high speed and efficiency. We build them from 2" up to 20" discharge. They are bronze fitted and where pumping acids the entire water end is made of acid-resisting bronze. This type is used by the Navy Department, arranged for belt, motor or turbine drive as desired.

DREDGING PUMPS

MORRIS DREDGING PUMPS are made in sizes from 2" discharge and upward, built of cast iron, carbon or manganese steel, both lined and unlined. They are belt driven or direct connected to steam engines. For the sake of economy 15-inch and larger dredging Pumps are usually directly connected to compound or triple expansion steam engines. We have also many dredging pumps in service directly connected to electric motors. We can furnish pumps only or the complete dredge, including all machinery.

STEAM ENGINES

We also build a complete line of STATIONARY and MARINE ENGINES, in single cylinder, compound and triple expansion types from 1½ up to 1000 H. P.

Write for complete catalog today



MORRIS MACHINE WORKS

At present we are making a specialty of circulating pumps for surface condensers, marine engines, as well as dry dock pumps.

Illustration at the right shows one unit of a large dry dock pumping system, which consists of three 36-inch directly connected Pumping Engines. Total average capacity, 115,000 gallons per minute. Total horse-power engines, 1050.

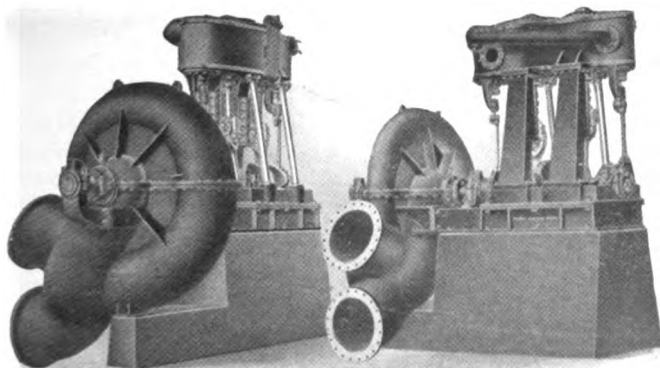
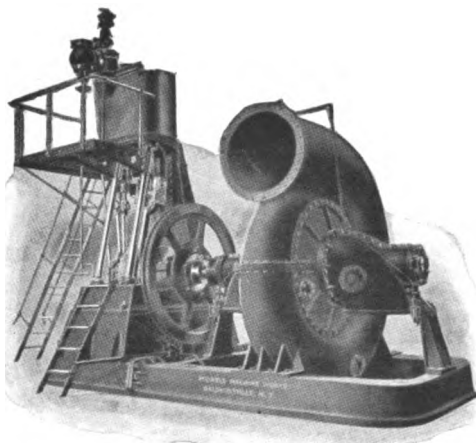
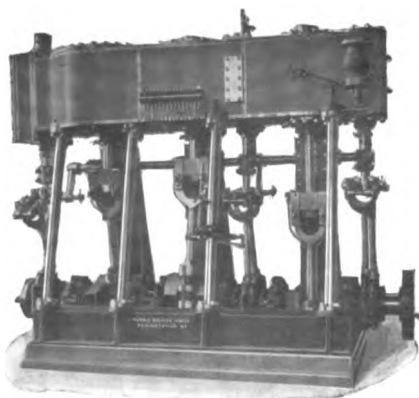


Illustration above shows a set of large circulating pumps for surface condensers. They are 20-inch All Composition Pumps, directly connected to Compound Engines. Built for 250 pounds steam pressure.

Illustration at the right shows a large triple expansion marine engine of 800 H. P.



NOVO ENGINE CO.

LANSING, MICH.

Manufacturers of Novo Gasoline and Kerosene Engines from 1 to 15 H. P., Hoists, Force Pumps, Diaphragm Pumps, Air Compressors, Saw Rigs, Etc.



The Novo Engine is exceedingly simple and reliable in every way. They are built of the very best possible material for long and continuous service under the hardest of conditions. Novo Engines are frost-proof, simple in construction with few working parts, and with practically nothing about them to get out of order. Practically anyone can operate the Novo Engines entirely satisfactorily. Novo Engines are built in the following sizes: 1½, 2, 3, 4, 6, 8, 10, 12 and 15 H. P. The 12 and 15 H. P. sizes are of the two-cylinder type.

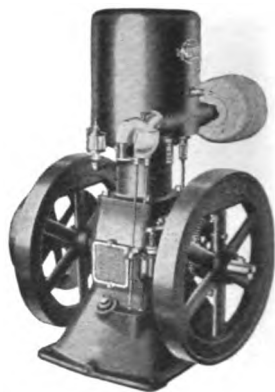


Fig. 255

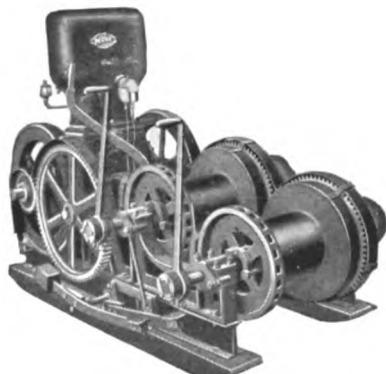


Fig. 172

Novo Hoists are made in forty-four different sizes and types, all combinations, both single and double drum, one or two speeds, reversible or non-reversible. Novo Hoists are light in weight for the power developed so they are easily moved about. They can be started and stopped as soon as the job is ready and completed so there is no waste of fuel. They take up very little space so can be used anywhere. The Type DH Hoist shown in Fig. 172 shows the double drum, reversible hoist with 15 H. P. Engine.

The Novo Line also includes a variety of Saw Rigs especially built to stand the hard usage demanded of them on all construction jobs. They will save enough time to pay for themselves on one fair-sized job.

Ask for our special bulletin on Saw Rigs.

We have only illustrated here a small part of the Novo Line. There are two hundred and fifty different sizes and types to choose from.

You should have our general catalog entitled "Reliable Power," and our book, "Standardized Power," containing description and full specifications of Novo Engines and Outfits.

NOVO ENGINE CO.

NOVO ENGINES AND OUTFITS (Continued)

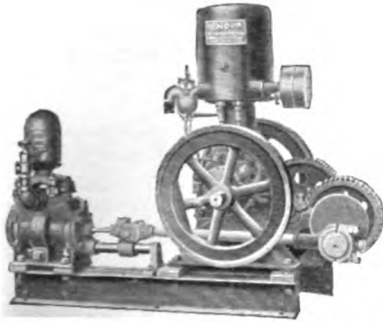


Fig. 14139

Novo Triplex Pumping Outfits illustrated in Fig. 1446 are also recommended for high pressure pumping where a steady pressure is necessary. The strokes of the three cylinders overlap, thus maintaining a uniform supply. Built in any size up to 15 H. P.

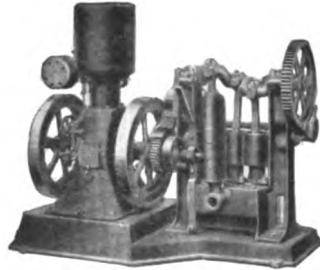


Fig. 1446

Novo Diaphragm Pumping Outfits shown in Fig. 179 mounted on skids or hand trucks with one or two pumps as desired, are exceedingly useful for draining excavations, trenches, etc., where muddy and gritty water has to be handled.

445

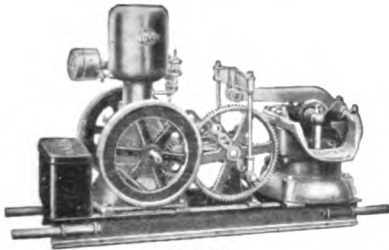


Fig. 179

Novo Air Compressor Outfits as shown in Fig. 276 with single cylinder compressor or double cylinder types, not illustrated, have capacities from 5 to 140 cu. ft. of free air per minute. Will operate all kinds of air tools perfectly satisfactorily.

Our books, "Reliable Power," and "Standardized Power," give full information on all Novo Engines and Outfits. Yours for the asking.

The Novo Outfits also include chain-driven and direct-connected centrifugal pumping outfits. They move large volumes of muddy or gritty water quickly.

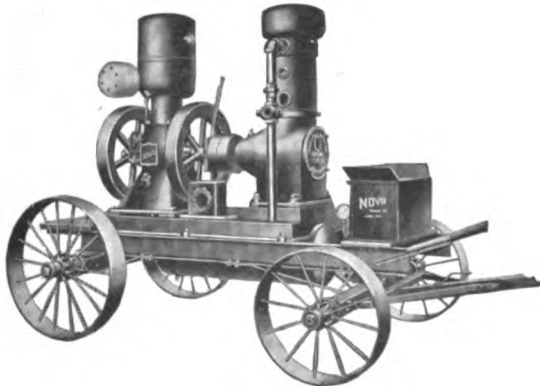


Fig. 276

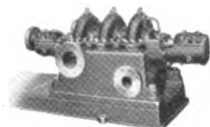
PLATT IRON WORKS

GENERAL OFFICES: DAYTON, OHIO

Branch Offices in Principal Cities

"Platt" Centrifugal and Turbine Pumps; "Smith-Vaile" Steam and Power Pumps and High-Duty Pumping Engines; "Stilwell" Feed Water Heaters; "Victor-Francis" Low and High Head Water Wheels; "Smith-Vaile" Oil Mill Machinery and Equipment

PLATT DOUBLE SUCTION CENTRIFUGAL PUMPS



Split case features insure accessibility. Their rugged construction guarantees efficient and continuous service whether installed where every facility is at hand, or in the most isolated parts of the world.

Fully described in bulletins Nos. 775, 762, 793.

SMITH-VAILE YOKE TYPE BOILER FEED PUMPS



Provided with removable and interchangeable water cylinder linings and adjustable packed water pistons, permitting compensation for wear.

Bulletin No. 788 will interest every engineer.

STILWELL FEED WATER HEATERS

Class "O" Type

Either Thoroughfare or Switch Valve Type. Fitted with float controlled or water seal overflow as may be necessary. Single piece castings, special design for raw water control, perfect filtration, make them pre-eminent.

Bulletins Nos. 783 and 784 are descriptive.

VICTOR-FRANCIS HIGH AND LOW HEAD WATER WHEEL

The epoch-making installation of Victor-Francis equipment to produce 50,000 horse power at Cohoes, N. Y., indicates the high efficiency that can be obtained with well-designed and carefully built Platt products.

Bulletins Nos. 789, 790, 791 describe the line.



SMITH-VAILE COMPOUND DUPLEX PUMPING ENGINES

Economical steam construction by multiple expansion. Undeveloped energy of steam after the completion of the stroke in initial cylinders is conserved and employed in expansion cylinders. A saving of from 25 to 35 per cent.

Bulletin No. 788 gives details.



SMITH-VAILE TRIPLEX PUMPS

Belt Drive Chain Drive Direct Geared

Four bearings insure reliability for day-by-day service in a practically unlimited range of application. May be belt driven from any available source of power, or direct connected by coupling, gears or chain to any form of motive power.

See Bulletin No. 781.



No matter whether they are installed under the most favorable conditions or in the most isolated parts of the world, Platt products are pre-eminent for quality and service.

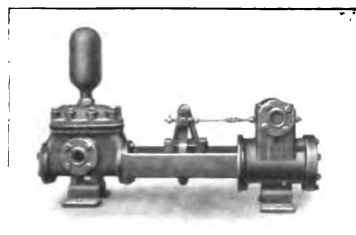
Engineers, specially trained for particular problems, are maintained in every department. This assures you the best possible service.

Catalogs, bulletins, drawings and complete data covering our lines sent promptly on request.

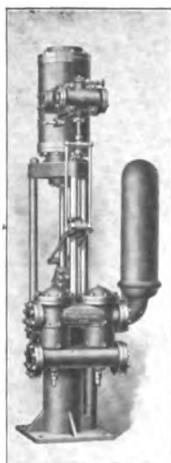
WORTHINGTON PUMP AND MACHINERY CORPORATION

MAIN OFFICE: 115 BROADWAY, NEW YORK

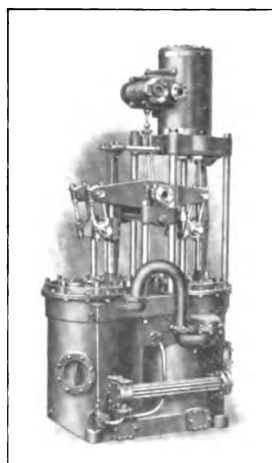
BLAKE-KNOWLES WORKS: EAST CAMBRIDGE, MASS. Branch Offices in All Principal Cities
Simplex Pumps, Vacuum Pumps, Underwriter Fire Pumps, Boiler Feed Pumps



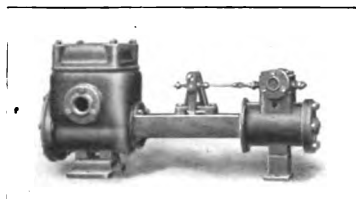
Style "A" Boiler Feed Pump



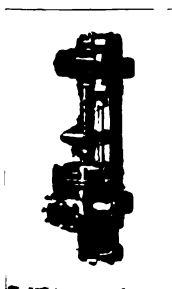
Vertical Boiler Feed Pump



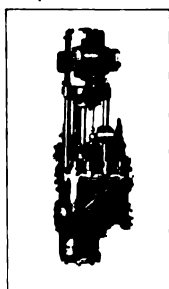
Twinplex Vacuum Pump



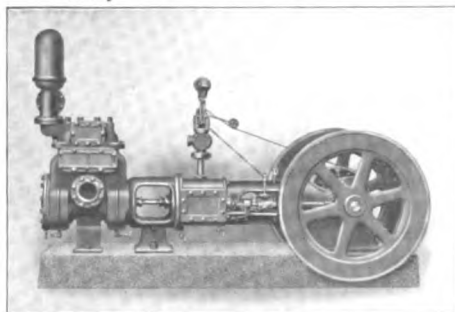
Steam Heating Vacuum Pump



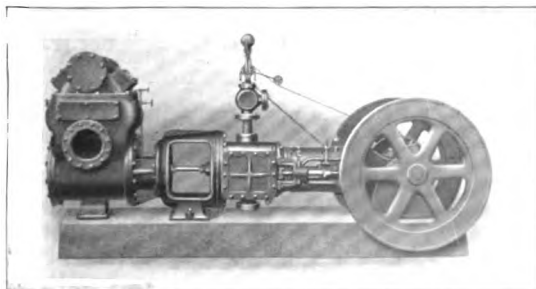
Vertical Pump



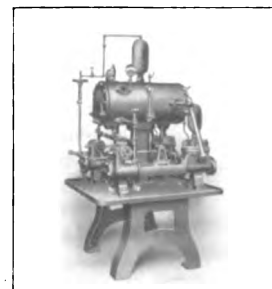
Vertical Pump



Single Flywheel Cane Juice Pump



Single Flywheel Sweet Water Pump



Fuel Oil Pumping System
 B 338.8

LAMMERT & MANN CO.

WOOD & WALNUT STS., CHICAGO, ILL.

**Manufacturers of Rotary Vacuum Pumps, Centrifugal Pumps, Pressure Pumps
Engineers—Machinists**

LAMMERT VACUUM PUMPS

Pistonless

Valveless

Rotary

Our pumps are designed for the *highest possible dry vacuum* and meet a long-felt want for a high grade, high duty pump, where a high, dry vacuum is required.

To give an even, high vacuum there must be no valves to leak or stick, no piston and rings to wear out and the lubrication must be perfect. The LAMMERT pump not only meets these vital requirements, but does it with reliability, low maintenance cost and minimum power.

We avoid wear and leakage by the use of simple device peculiar to the LAMMERT Pump and by constantly flooding oil upon the working parts by automatic oilers.

With our new silencer and the absence of reciprocating parts, the LAMMERT Pump is free from noise and vibration.

Styles—Sizes

LAMMERT Vacuum Pumps are made in several styles and sizes to meet the various demands of service.

The smaller, light service pumps, which are capable of easily attaining a vacuum of 26 inches of mercury, are

air-cooled, having exceptionally large radiating surface for that purpose. Size Numbers 2, 3 and 4 with capacity of 7, 14 and 24½ cubic ft. per min., respectively.

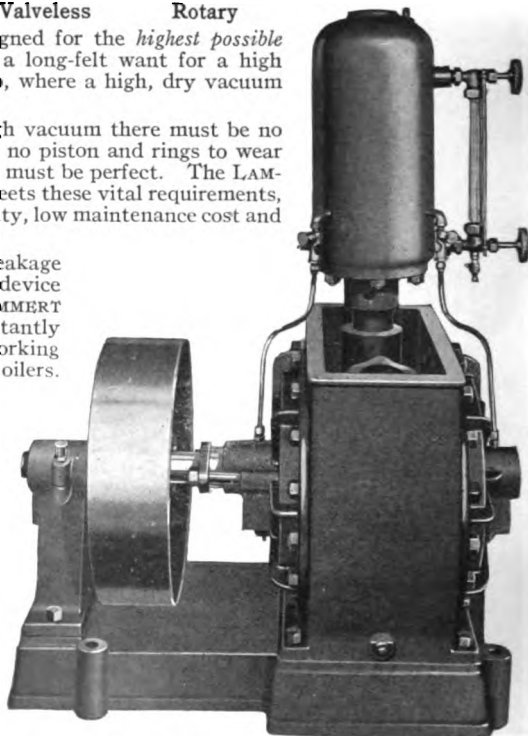
The oiling system in these pumps is of the capillary type. The oil reservoir holds a supply sufficient to run the pump for thirty hours. No oil is wasted as the oil starts and stops coincident with the starting and stopping the pump.

The larger pumps are water-cooled and are capable of easily maintaining continuously a vacuum of 27 inches of mercury at sea level. Size Numbers 5, 5½, 6 and 7 with capacity of 55, 67, 90 and 180 cubic ft. per min., respectively.

With the tandem high duty, water-cooled pumps we can maintain the highest possible vacuum. Size Numbers 5A, 5½A, 6A with capacity of 55, 67 and 90 cubic ft. per min., respectively.

CENTRIFUGAL PUMPS—CONTRACT WORK

We also build rotary pumps to handle the heaviest products



Single Stage Water-Cooled Pump



RODNEY HUNT MACHINE CO.

ORANGE, MASS.

Manufacturers of Turbine Water Wheels, Water Controlling Apparatus, Power Transmission Equipment, Underwriter Rotary Fire Pumps, Textile Wet Finishing Machinery

TURBINE WATER WHEELS

Hunt—McCormick and Hunt—Francis. Result of over 40 years' effort toward getting the greatest power with best speed and efficiency results. Complete accessory equipment.



WATER CONTROLLING APPARATUS

for water power plants, power and storage dams, filtration and irrigation systems. Penstocks, flumes, etc. Relief valves and gauges. Gates and valves. Gate hoists and floor stands. A staff of trained engineers always at your service.



RAKES FOR TRASH RACKS AND SCREENS

The best rake you can buy—hence the cheapest. Of pressed steel, unbreakable, light—easy to handle—has extra deep basket. Handle stays in. End teeth guards practically eliminate interference with screen back bars. With HUNT screens there is no interference. Price \$8; handles extra.



WE SPECIALIZE IN TEXTILE WET FINISHING MACHINES

for dyeing, bleaching, rinsing, washing, scouring and fulling goods in the string of roll. Ask about our Type M Fulling Mill, Type F-1 and F-2 combination scouring, fulling and finishing machines, also Washers and HUNT Reel Machines. All have standardized, interchangeable parts instantly replaceable.



ROLLS FOR EVERY PURPOSE

made entirely in our own factory from the best woods that grow, properly seasoned for the particular work in view. Prompt shipment is one of the things you will like about HUNT roll service. Try us.



Send for Catalog on

TURBINE WHEELS

WATER CONTROLLING APPARATUS

WET FINISHING TEXTILE MACHINERY

RAKES AND SCREENS

ROLLS

POWER TRANSMISSION EQUIPMENT

UNDERWRITER ROTARY FIRE PUMPS



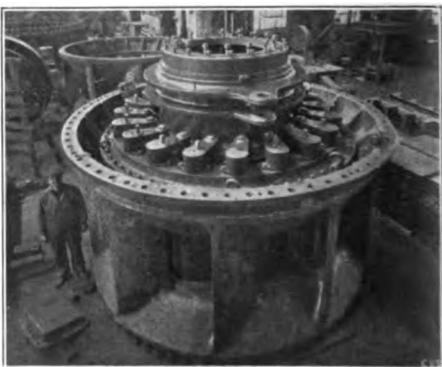
I. P. MORRIS DEPARTMENT
OF THE
WM. CRAMP & SONS SHIP & ENGINE BUILDING CO.
RICHMOND & NORRIS STS., PHILADELPHIA
Hydraulic Turbines

A typical water-power development showing most approved modern practice for medium head plants.

The new station of the Rochester Railway & Light Co.



The speeding and guide vanes are of cast steel. The operating mechanism is of the "outside" type.



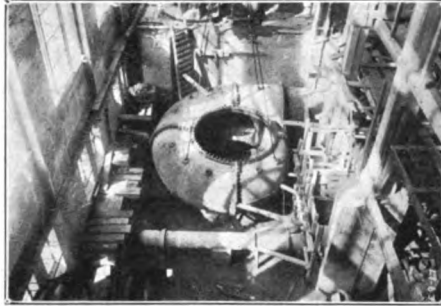
The turbine is of the vertical shaft single-runner type.



The turbine casing is of cast iron, and is tested in the shops of the builder under a hydrostatic pressure in excess of any pressure which can be produced by sudden gate closure after installation.

**I. P. MORRIS DEPARTMENT
OF THE
WM. CRAMP & SONS SHIP & ENGINE BUILDING CO.
RICHMOND AND NORRIS STS., PHILADELPHIA
Hydraulic Turbines**

The casing may be quickly assembled and set in place in the power-house.

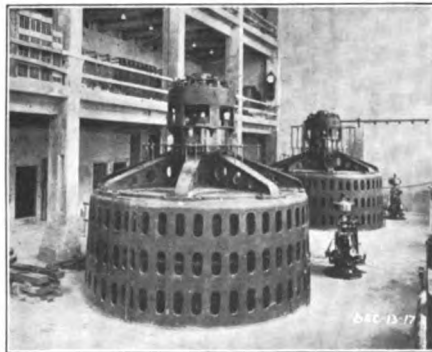


The casing is rigidly imbedded in the concrete substructure of the power-house, and the turbine pit is formed directly in the concrete

451

The generator base is set in the concrete foundation. The thrust bearing is mounted above the generator.

This unit is of 16,000 H. P. and operates at 180 R. P. M. under a head of 130 feet.



**I. P. MORRIS TURBINES SO FAR BUILT OR CONTRACTED
FOR REPRESENT AN AGGREGATE CAPACITY OF OVER
TWO MILLION HORSEPOWER.**



THE PELTON WATER WHEEL CO.

Hydraulic Engineers

90 West St.
NEW YORK CITY

U. S. A.

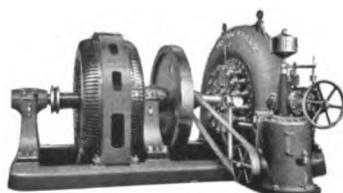
Harrison and 19th Sts.
SAN FRANCISCO, CAL.

**Designers and Builders of Pelton Impulse and Francis Hydraulic Turbines,
Centrifugal Pumps and Water Wheel Governors**



**Pelton Impulse Wheel Direct
Connected to Generator**

Impulse water wheels furnished for driving all classes of machinery. Unit sizes range from $\frac{1}{4}$ to 20,000 H. P. and for heads exceeding 2300 feet.



**Pelton-Francis, Horizontal Turbine,
Direct Connected to Generator**

Hydraulic turbines, either vertical or horizontal, designed and constructed for a wide range of head and capacity. Relief valves and water wheel governors.



**Pelton Standard Centrifugal Pump,
Motor Driven**

Standard belted or direct connected centrifugal pumps for general and irrigation service.



**Pelton Double Suction, Special
Centrifugal Pump**

Single- and multi-stage, high efficiency turbine pumps, for water works and condenser water circulation. Prime movers included with pumps when desired.

Address nearest office for literature and estimates.

THE JAMES LEFFEL & CO.

SPRINGFIELD, OHIO, U. S. A.

Manufacturers of Turbine Water Wheels, Steam Engines and Boilers

LEFFEL TURBINE WATER WHEELS

Vertical Leffel Turbine Water Wheels—Equipped with latest type of Leffel steel bucket runners mounted on vertical steel shafts. The revolving parts of these turbines are carried on special design step bearings. The gate casings are fitted with balanced swing type gates, each gate removable separately and fitted with adjustable steel connections. The gates are operated with Leffel's latest type of gate equipment. The bearings are of special designs and large dimensions (Fig. 1).

Horizontal Leffel Turbines—Are built in various types and designs, single and double discharges. Frequently to suit requirements two or more turbines are built on one horizontal shaft, developing large horse power and high speeds, for direct connection to driven machinery. Some of these turbines are constructed with steel casings and others for open penstocks (Fig. 2).

Type "Z" Leffel Turbines—These turbines of special design for developing high speed, high horse power, high efficiencies; vertical and horizontal designs, for direct connection to electric generators, milling machines, saws, grinders, pumps and other high speed machinery. These turbines are of the most modern and latest designs in all details.

Governors—This Company also furnishes governors for regulating the speed of the different designs and capacities of turbine water wheels. These governors are of the very latest types and designs throughout.

Guarantee—All of the work furnished by this company is fully guaranteed to be strictly first class throughout, of latest designs and of strong and substantial construction in all details.

Catalogs—Catalogs concerning these turbines furnished on application.

SPECIAL HYDRAULIC MACHINERY

This Company also builds head gate hoisting machinery, steel piping; also all kinds of power connections, shafting, gearing, pulleys, bearings, bridge-trees and many other designs of hydraulic machinery.

LEFFEL ENGINES AND BOILERS

This Company also builds a line of Throttling and Automatic Steam Engines and Boilers, Horizontal and Vertical, from 3 H. P. up. Figure 3 shows one of the many styles. Complete illustrated Catalog with full information on request.



Fig. 1
Vertical Turbine

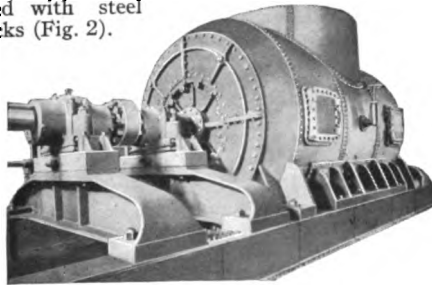


Fig. 2. Horizontal Turbine

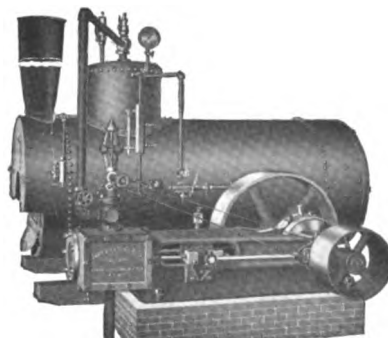


Fig. 3. Leffel Engine and Internal Fired Boiler

THE CHARLES BURROUGHS CO.

NEWARK, N. J.

Designers and Builders of Hydraulic Machinery for Any Service
Pioneers and Patentees of Full Automatic Hydraulic Presses
Research, Development and Experimental Engineers for all Industries
Automatic Machinery of Any Description—Tools, Jigs and Fixtures

OUR HYDRAULIC SPECIALTIES

Rodless Hydraulic Presses Patent

This style of press we recommend as the most rigid and simplest ever constructed, there being no rods to stretch or nuts to work loose. Absolutely parallel surfaces are maintained between the platens.

We can furnish any size and number of platens and any power.

Hydraulic Rod Presses

We have been building them for the past forty years for many purposes. Their use being diversified, we require sizes of articles and nature of material you propose to press before we can quote.

Hydraulic Pumps

Plain Hand, High and Low Pressure Hand, Belt or Motor Driven, 2, 3, 4 and 6 plunger, with accumulator stop; automatic change high and low pressure; any combination to suit your requirements.

Hydraulic Accumulators

Weighted with cast weights, or scrap.
Variable Pressure.

We can always suit your requirements.

A Large Variety Hydraulic Valves and Fittings. Special Steamplates.

Hydraulic Tools and Ma- chine Tools (Mostly patented)

Extruding Machines, Dehydrating Presses, Special Moulding Presses, Sheeting Planers, Hubbing Press, Cabbaging, Bundlers, Baling Presses, and any machine tool with hydraulic feed.

Moulds

Forty years ago we were the pioneer makers of Moulds for "Celluloid" articles. Since then we have made them for every conceivable article in practically all of the compositions known to the art to-day. Steam and gas or electrically heated.

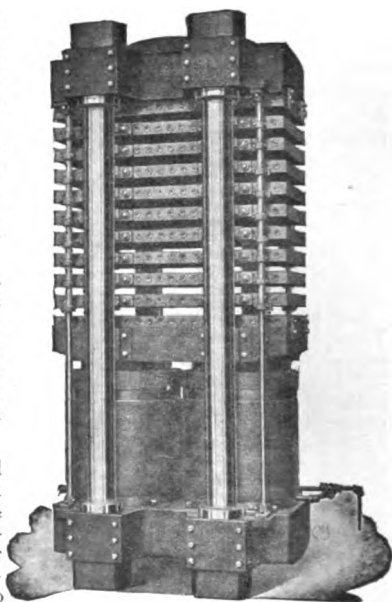
Send us a sample article and we will quote.

Complete Plants

For Pyroxylin Compounds (known under various trade names), Shellac Compounds (known under various trade names), Bakelite, Condensite, etc., etc.

Angle Presses, Semi Automatic and Fully Automatic Presses. Bending, Forcing, Wheel, Shell Testing and Straightening Presses.

Send for our special catalogues.



Multiple Opening
Hydraulic Rod Press

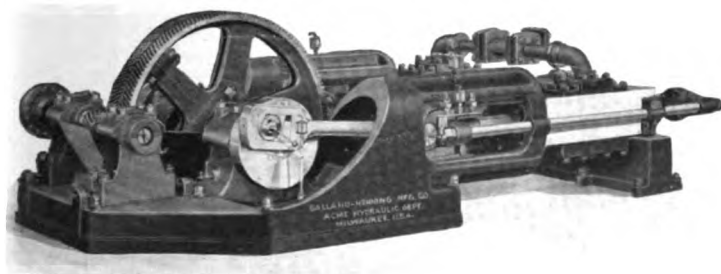
GALLAND-HENNING MFG. CO.

26TH-27TH AVE. AND LAYTON PARK
MILWAUKEE, WIS.

HYDRAULIC

PRESSES—PUMPS AND ACCUMULATORS

HYDRAULIC PRESSES for all purposes. Wheel Presses, Shaft Straighteners, Drawing, Stamping, Arbor, Broaching Presses, Etc.



455

PUMPS, High Pressure, Vertical, Horizontal and Double Pressure Pump.

BALING PRESSES for waste paper, rags, cotton, shoddy, etc. Also for finished textiles.

SCRAP METAL BUNDLING PRESSES for bundling scrap steel, copper, brass, aluminum, sheet wire and stamping. Also soft metal turnings and shavings.

MALTING MACHINERY—Pneumatic Drum and Compartment Systems.

DRYING EQUIPMENT—For Grains, Starch, Glucose, Fruit Pomace, Etc.

ANGLE BENDING—For Bending and forming angle iron and bars.

SOUTHWARK FOUNDRY & MACHINE COMPANY

Established 1836

PRINCIPAL OFFICE: 400 WASHINGTON AVE., PHILADELPHIA

DISTRICT OFFICES

Equitable Building, New York City

Brown-Marx Building, BIRMINGHAM

Designers and Builders of:

Hydraulic Machinery

Machinery for the Rubber Industry

Boiler Shop Machinery

Shipyards Machinery

Scrap Reclaiming Machinery

Railroad Shop Machinery

Locomotive Repair Machinery

Flue Welders

Washer Machines

Powder Presses

Power Tools



**Double-Acting Drawing
Press for Deep Stamp-
ing Work**

We install complete **HYDRAULIC PLANTS** comprising Presses—all types and sizes; Pumps, Accumulators, Intensifiers, Valves, etc.

THE WATSON-STILLMAN CO.

35 CHURCH ST., NEW YORK

Engineers and Builders of Hydraulic Machinery—Pumps, Valves, Accumulators, Intensifiers, Boosters, Jacks, Pitjacks, Lifts, Punches, Shears, Benders, Straighteners, Riveters, Coping Shears, Bolt Forcers, Baling Presses, Bulldozers, Forging Presses, Metal Extrusion Presses, Forcing Presses, Tunnel Shield Cylinders and Equipment, Etc.

In our long experience of 70 years, we have designed, built and have patterns for over 5000 complete hydraulic machines for practically every use to which hydraulic pressure has been found adaptable.

HYDRAULIC PRESSES

We have a standard line of presses for forcing, force fitting, assembling; presses for broaching, metal forming, metal extruding; presses for die sinking, die forming, embossing; presses for baling metal, scrap, cloth, etc., presses for briquetting of granular materials, presses for forging, drawing, tube drawing; heating presses and chilling presses for forming rubber and composition goods in molds.



Hydraulic Forging Press



Tank Weighted
Accumulator

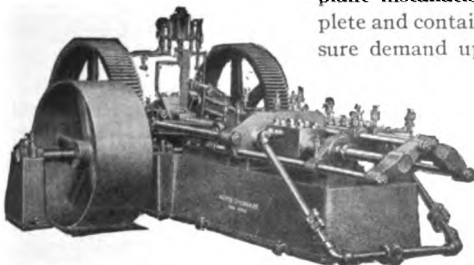
HYDRAULIC ACCUMULATORS

We build accumulators in seven types, plain cylinder, inverted cylinder, yoke cylinder, plain and variable pressure, differential ram, hydro pneumatic and intensifier.

HYDRAULIC PRESSURE PUMPS

We have given particular attention to the appurtenances necessary to complete hydraulic plant installation. Our line of pumps is complete and contains a standard type for every pressure demand up to 10,000 lbs. per sq. in. and every detail has been worked out to give the maximum of efficiency.

We are prepared to design special equipment to suit your own specifications.



High Pressure Pump



R. D. WOOD & COMPANY

PHILADELPHIA, PA.

Engineers, Iron Founders, Machinists

HYDRAULIC MACHINERY

Hydraulic Presses of every description for the heaviest work, Hydraulic Forging Presses, Punches, Shears, Riveters, Intensifiers, Hoists, Pressure Pumps, Cranes, Valves, etc., etc. For the majority of operations to which hydraulic power can be applied, and especially those requiring very great force exerted through a comparatively short stroke, as in riveting, punching, shearing, lifting, forging and flanging, there is no other system at all comparable with it for efficiency, uniformity, simplicity or economy. This is true for several reasons; primarily in that there is absolutely no motion or power consumed except in the act and at the moment of performing the desired operation.

HYDRAULIC VALVES

Hydraulic Operating Valves, Check, Foot, Stop and Shock Relief Valves.

A high grade valve is an essential to the satisfactory operation of hydraulic machinery.

We are building a patented type of operating valve which is giving excellent service. We have also a special line of Check, Foot, Stop and Shock Relief Valves.

CAST IRON PIPE

Bell and Spigot Pipe from 1 inch to 84 inches in diameter, Flange Special deep bell, High Pressure, Flexible joint for Submarine Work, Standard and Special Fittings, Heavy Loam and Dry Sand Castings.



GENERAL MACHINERY

Our shops are well equipped for building large machinery of every description, such as sugar, chemical and similar work.

IRON CASTINGS

We are especially well equipped for making large and intricate loam castings; also castings in dry sand and green sand.

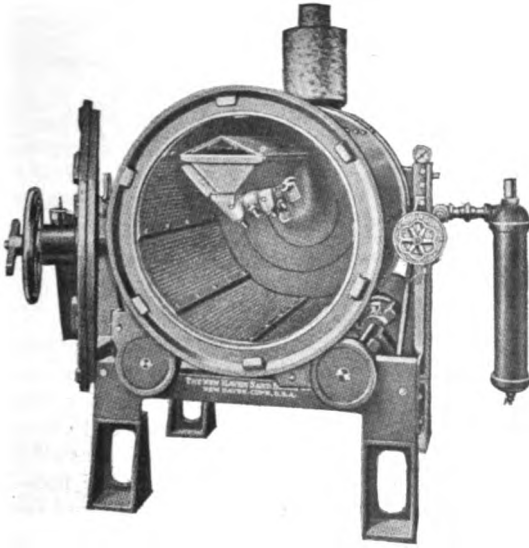
HYDRANTS AND VALVES

Fire Hydrants, Mathews patents for standard and high pressure. Gate, Check, Foot and Air Valves, Valve Boxes, Indicator Posts, Foot Valve and Intake Screens, Hood Racks, etc.

NEW HAVEN SAND-BLAST CO.

NEW HAVEN, CONN.

Manufacturers of Dreisbach Patent Sand-Blast Rolling Barrel



459

ARE YOU CONSIDERING SAND-BLAST?

If so, stop and consider the merit of construction before placing your order. The cost of maintenance after machine is installed is a very important factor and should not be overlooked. **The New Haven Self-Contained Sand-Blast Barrel** is the only barrel made that cleans the work, removes the dirt and recovers the sand to be used again all inside the barrel. This feature keeps the rollers, bearings, etc., away from the dust and dirt caused by the blast and avoids excess wear that increases costs and retards production.

CLEAN YOUR FORGINGS by sand-blast; it eliminates all the discomforts and expense of acid. The work is more satisfactory; your plant is clean and your employees are given a wholesome atmosphere to work in.

CLEAN YOUR WORK FOR GALVANIZING by sand-blast; you will obtain a cleaner and better surface than by any other method. Our barrel will do the work of four or five men with scratch brushes, increasing your production and reducing your costs.

CLEAN YOUR CASTINGS by sand-blast; the same benefits are derived as from forgings. Do not stop to knock out cores by hand. **THE NEW HAVEN SELF-CONTAINED SAND BLAST BARREL** will remove the cores and remove all dirt for you.

Send for catalogue A. E. stating your requirements and we will be glad to give you the benefit of our experience.

PANGBORN CORPORATION

P. O. BOX 859, HAGERSTOWN, MD.

**Engineers, Designers and Manufacturers Exclusively of Sand-Blast
and Allied Equipment**



The "Pangborn" line embracing, as it does, every practical system of sand-blasting, assures the user of counsel unbiased by limited designs and equipment. Hose Sand-Blasts, Sand-Blast Guns, Cabinet, Table and Barrel Sand-Blasts in single units or in combination and with specially designed rooms with ventilating systems to meet the individual conditions, cover every demand from the smallest to the largest.



Hose Sand-Blast

Hose Sand-Blast: The Standard Direct Pressure Sand-Blast and the most effective of the various designs and types of Sand-Blast Equipment. Will do work possible with any type of sand-blast. It is particularly adapted to large pieces or extensive surfaces and work of a varied character. Made in several sizes and designs for installing either on the floor level or in pit below the floor for continuous gravity feed. Also open hopper types for limited demands.



Cabinet Sand-Blast

Cabinet Sand-Blast: A self-contained Sand-Blast Machine of the continuous feed, suction type, occupying small space. It represents a complete Sand-Blast device at lowest first cost—Designed for small pieces, light work or small volume—Made in various designs with stationary and flexible nozzles.

Also with self-contained impeller type Compressor for Matt finishing at up to 8 lbs. pressure.



Barrel Sand-Blast

Barrel Sand-Blast: The most rapid and economical method of cleaning quantity production work too small for individual handling—Gravity feed, full value of air pressure. Self-contained, continuous feed, substantially built, requires no pit or foundation.

Will take pieces up to limit of door opening. Made in three sizes. Also in other types for smaller work.

PANGBORN CORPORATION



Table Sand-Blast: An automatic, self-contained, continuous feed, direct pressure, hygienic Sand-Blast for work of precision that would suffer from contact in handling fragile castings or castings, forgings, etc., of odd or cumbersome shapes not adaptable to other methods of handling.

Made also in other types for crockery, glassware etc.

Room Sand-Blast: A complete Sand-Blast Installation (structural steel room)—Abrasive falls through grated floor to conveyor and elevator. Separator eliminates coarse and fine refuse from re-usable abrasive. Ventilated to ten changes of air per minute. Dust confined in Cloth Screen Arrester. Equipment outside of room—controls within. Room can be equipped with bench, car or monorail required.

"E H" Cabinet: A hygienic, semi-automatic direct pressure Sand-Blast Installation for work up to 4 feet largest dimension. For use with Hose Machine placed either on floor level or in Pit beneath the Cabinet, for continuous operation. Pieces are loaded on the rear of revolving table, the partition of which entirely closes the Cabinet, the Operator working on the outside free from flying abrasive and dust.

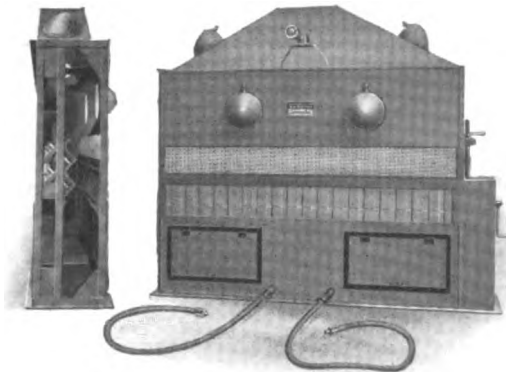
"E J" Shell Cabinet:
A hygienic high-pressure artillery shell cleaning Cabinet for quantity production. Direct Pressure Hose Machine placed on floor level or pit for continuous feed—shells loaded and unloaded from rear by common labor giving constant operation of Sand-Blast—equipped for one or two operators—other types of automatic and semi-automatic shell cleaning devices.



Table Sand-Blast



Room Sand-Blast



THE FROST MANUFACTURING CO.

Established 1851

WORKS
GALESBURG, ILL.

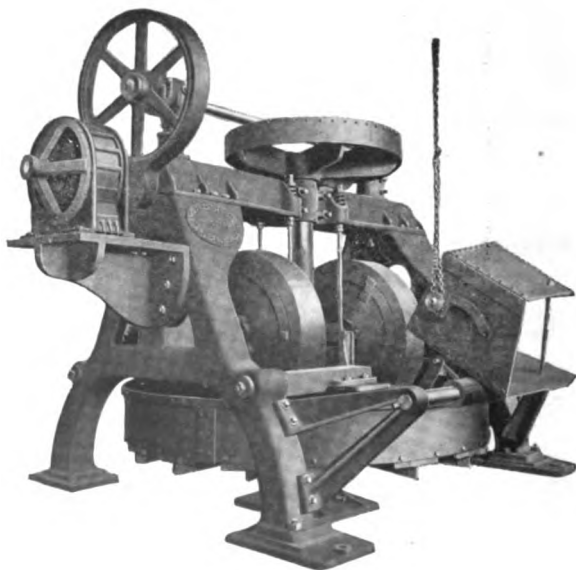
GENERAL SALES OFFICE
112 W. ADAMS ST., CHICAGO

Manufacturers of the Frost Wet Pan for Steel Foundries, also Dry Pan for Clay Crushers

THE *Frost* WET PAN SAND MILL

for

Preparing Sand for Foundry Mixtures



This mill is made in sizes for capacities from $\frac{1}{2}$ yard per batch to $1\frac{1}{2}$ yards per batch. Has very heavy chilled mullers racing on chilled grinding plates. The bucket unloader is operated by an air hoist controlled by one valve so that the operator is never in danger.

These machines are built in a most workmanlike manner, and are so designed that parts likely to wear can be readily replaced with a minimum of waste.

THE E. J. WOODISON COMPANY

FACTORY AND HOME OFFICE, DETROIT, MICH.

*Boston
*Buffalo
Cleveland

Indianapolis
Montreal
*St. Louis

*Seattle
*Toronto
Windsor

Fire Brick, Foundry Supplies and Equipment, Platers' and Polishers' Supplies and Equipment

We are both manufacturers and jobbers in our line and twenty-five years of experience enables us to give maximum service and value to our customers.

We carry large stocks at the above branches marked with a (*) and are at all times best able to serve your needs.

A complete line of whatever you may require includes such items as

Crucibles

Machines, Molding

Chaplets

Machines, Core

Chaplets (Perforated)

Platers' Supplies

Compositions (Polishers)

Platers' Equipment

Compositions (Parting)

Polishers' Equipment

Fire Brick

Polishers' Supplies

Foundry Facings

Wax Vent

Foundry Supplies

**"Woodseed" Liquid
Core Compound**

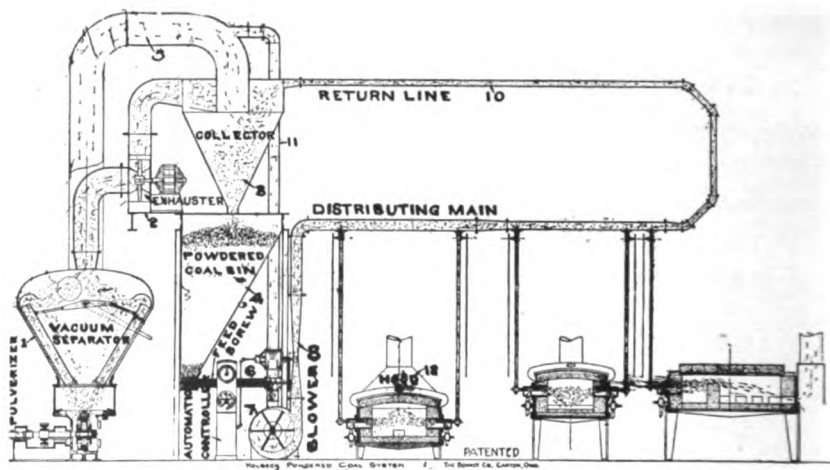
Foundry Equipment

In other words we are able to supply you with whatever you may need in the Foundry or Polishing and Plating departments.

THE BONNOT COMPANY

CANTON, OHIO

**Manufacturers of Clay Working and Portland Cement Machinery
Holbeck System Pulverized Coal Equipment**



Sectional View Pulverized Coal Distributing System

HOLBECK SYSTEM OF AIR DISTRIBUTION WITH AUTOMATIC REGULATION

FOR HEATING PLATES, BILLETS, INGOTS, FORGINGS, RIVETS, BOLTS, ETC.,
AND OTHER INDUSTRIAL PURPOSES.

PORTLAND CEMENT MACHINERY

INCLUDING ROTARY KILNS, ROTARY DRYERS, PULVERIZERS, TUBE MILLS,
BALL MILLS, ETC.

BRICK AND TILE MACHINERY

DRY PANS, WET PANS, PUG MILLS, MIXERS, CLAY SCREENS, BRICK MA-
CHINES, TILE MACHINES, BRICK CUTTERS, TILE CUTTERS.

BONNOT PULVERIZERS

FOR GRINDING LIMESTONE, PHOSPHATE ROCK, COAL, ETC., EITHER WITH
OR WITHOUT AIR SEPARATOR.

BALL MILLS FOR GRINDING ORES

SPECIAL MACHINERY

FOR CHEMICAL PURPOSES, OIL REFINERIES AND OTHERS.

CHALMERS & WILLIAMS, INC.

GENERAL OFFICE AND WORKS

1450 ARNOLD ST., CHICAGO HEIGHTS, ILL.

Manufacturers of Mining and Crushing Machinery

PRODUCTS: Symons Disc Crushers. Also, Jaw Crushers, Stamp Mills, Huntington Mills, Crushing Rolls, Chile Mills, Cyanide Filters, Revolving Screens, Pulsating Screens, Disc Crushers, Tube Mills, Ore Reduction Machinery, Rock Crushing Machinery, Gyratory Crushers, and Adjustable Quick Discharge for Tube Mills.

SYMONS COARSE DISC CRUSHERS

Crushing is done between two dish-shaped discs of manganese steel set with their concave sides facing each other. These discs rotate in the same direction at the same speed and are supported at an angle to each other.

When stone is fed through the central feed opening, it is thrown by centrifugal force into the opening where the discs are widest apart. It is carried around with them to where they are closer together and is crushed in the operation. The smaller particles fly out from between the discs, into the encircling chute, while the larger particles are caught again and the operation repeated.

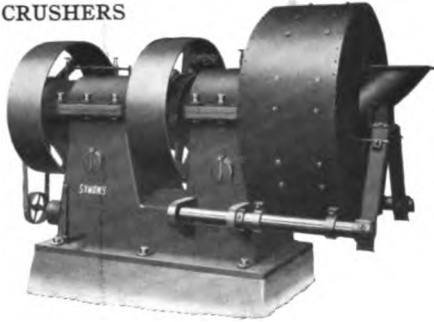
Advantages—Support of the feed spout is adjustable. This spout, being elliptical in cross section, is well adapted to deliver slabby pieces into the crushing cavity. The hood casing completely encloses the crushing members.

An important feature is that the manganese crushing discs wear smooth—not in grooves. This allows them to be set closer together to take up wear.

Construction, Feed and Discharge—The stone or other material, which enters through the central feed spout shown, is quickly spread by centrifugal force over the surface of the discs. Particles are separated—not packed together. The feed is forced and the product thrown out by a force many times stronger than gravity. The quick escape of particles broken to the proper size avoids unnecessary crushing. This prevents waste of power, avoids undue crushing strains, and results in a minimum of fines.

Size of Product—Size of product may be regulated to suit the demands of the trade by changing the distance between crushing discs.

A wide range of adjustment is provided.



465

TABLE OF WEIGHTS AND CAPACITIES

Size of crusher	18-in.	24-in.	36-in.	48-in.
Approx. shipping weight, lbs.	5600	8500	23,500	39,000
Size of feed, ins.	1½	2½	3½	6½
Minimum exit opening for best results, in.	¾	½	¾	1
	Size of ring Tons per hour	Size of ring Tons per hour	Size of ring Tons per hour	Size of ring Tons per hour
Minimum capacity in tons per hour	¾ = 5-8	½ = 12-15	¾ = 25-30	1 = 45-60
	½ = 8-10	¾ = 18-20	1 = 30-45	1½ = 60-80
	¾ = 10-12	1 = 20-25	1½ = 45-60	2 = 80-100
	1 = 12-15	1½ = 25-30	2 = 50-65	2½ = 100-120
R. p. m. main pulley	200	200	133	100
R. p. m. eccentric pulley	450	400	300	250
Size of pulleys, ins.	28 x 8	34 x 10	44 x 14	54 x 16
H. p. required	12-18	18-25	30-40	50-65

E. H. STROUD & COMPANY

Established 1896

928, 930, 932 & 934 FULLERTON AVENUE
CHICAGO, ILLINOIS

Engineers and Manufacturers of Machinery for the Reduction of All Sorts of Dry Grindable Materials, Animal, Chemical, Mineral, and Vegetable, and Some that Carry 6% to 8% of Moisture; also of Powdered Coal Burning Equipment

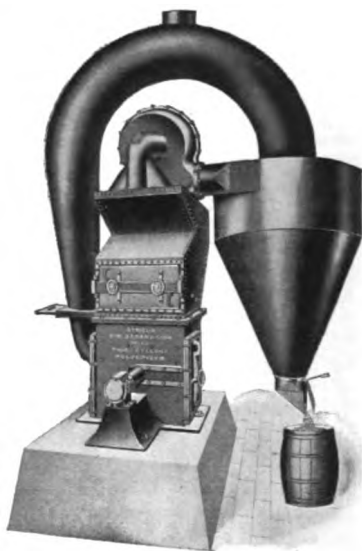
CRUSHING AND GRANULATING ROLLER MILLS

with either pointed or chisel-shaped cutters, one pair, two pairs, or three pairs of rolls high, per mill. Ask for Bulletin No. 200.

STROUD AIR SEPARATION PULVERIZERS

Our illustration shows a Product Collector attached to the Pulverizer. We build Air Vent Chambers too.

These mills give a finished product direct which, without subsequent sieving, is so uniformly fine that 95% or 98% or all of it, as wanted, will, if tested when dry, pass through a horizontal brass wire cloth testing sieve of the desired mesh, which can be any mesh from, say, 40x40, down to the most impalpable powders, a finer than a 200x200 mesh. They are without exception the most efficient Pulverizers made. Dustless in operation. Difficult to clog. Easy to clean. A cool Pulverizer for chemicals. So automatic in feeding and operation that one man can attend half a dozen mills. Cost of milling very low. Ask for Bulletin No. 101.



CAPACITY ON BITUMINOUS COAL TO 100x100 MESH 95% FINE

SIZE OF PULVERIZER AND ITS OUTPUT IN POUNDS PER HOUR

Class "0" 8-10 H. P. Feed ½ in. cubes	Class "1" 15-20 H. P. Feed 1 in. cubes	Class "2" 25-30 H. P. Feed 1 in. cubes	Class "3" 40-50 H. P. Feed 2 in. cubes
650-850	2000-2500	4000-5000	8000-10,000

STROUD SCREEN SEPARATION CRUSHING AND GRINDING AND SHREDDING MILLS

With rigidly locked bar screens, adjustable, for making products from, say, 4x4 mesh down to 100x100 mesh. Ask for Bulletin No. 102-B. Very efficient machines of this type.

E. H. STROUD & COMPANY

STROUD POWDERED COAL STOKER AND BURNER

Receives the Powdered Coal, draws its own supply of air from the atmosphere, measures the coal and the air as used, mixes them thoroughly, delivers the mixture to the furnace (where it ignites at once) and enables the operator to have complete control of furnace temperatures, and to make records from which to duplicate his results at will. We build also a Stoker for Locomotives.

Illustration is of our Left-Hand Stoker. We build Right-Hand as well.

Stoker can also be built for either upward or downward delivery.

Slide →
to start and stop flow of coal.

Pulley →
or Electric Motor, or
Steam Turbine, as desired.

Outlet →
of Fuel Mixture.



← The Coal Tank
can be of other size
and shape if preferred.

→ Sprockets,
Chain, Worm and Gear,
which drive the Con-
veyor from spindle of
fan, and automatically
govern the supply of
coal.

← Air Inlet
and Controller.

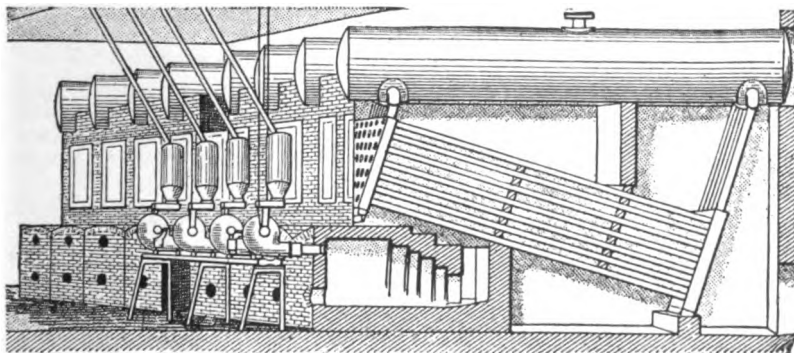
All persons are warned
that the ideas embodied in
the Stroud Powdered Coal
Stoker and Burner are well
covered by fundamental
patents.

Patented

Sizes and Capacities from 15 lbs. to 5000 lbs. of coal per hour per stoker with all the air needed for combustion. Write for Bulletins, No. 103-B and No. 107.

ROUGH SKETCH OF A TYPICAL STROUD METHOD INSTALLATION

We have purposely made an incorrect drawing of the Furnace and some other details because we do not wish to advertise or give away gratis information which has cost considerable time and money and effort. Our installation is as simple as that shown.



We have been the Pioneers in the art of pulverizing and stoking and burning Powdered Coal under Boilers and some other Heating Units.

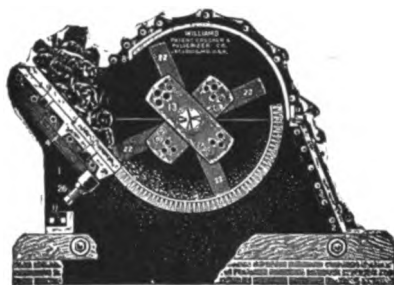
WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

OLD COLONY BLDG., CHICAGO

Manufacturers of Crushing and Grinding Machinery

BRANCH OFFICES: NEW YORK, SAN FRANCISCO, PHILADELPHIA, PITTSBURGH,
DETROIT, RICHMOND, VA. WORKS: ST. LOUIS

COAL CRUSHERS FOR COKE OVEN WORK, BY-PRODUCT AND BEEHIVE OVENS



By the use of the Williams Patent Hammer Crushers with the various adjustable features, the following results are obtained from the ovens: The oven pulls easier, more coke is made from each oven, the ash is reduced, the coke comes out firm, regular in size, does not crumble, and the structure is much improved.

The substantial construction of these machines is plainly shown in this cut; all parts subject to wear are easily adjustable, which includes the hammers, the discs, the cage bars, and the breaker plates. The housing is entirely protected from wear by heavy liner plates made of heavy chilled iron. The machine is very accessible, as it is made of sectional construction.

SPECIFICATIONS REGULAR CRUSHER

Size Mill	Hopper Opening	Size Feed	Capacity Tons per Hour				Speed	Size Pulley	Extreme Dimensions				Horse Power	W'ght
	In.		$\frac{1}{2}$ " & finer	$\frac{1}{4}$ " & finer	$\frac{1}{8}$ " & finer	R.P. M.	Dia.	Face	L'gth	W'th	H'ght		P'nds	
1	15x12	Runge Mile	30-40	25-30	20-25	1000	20"	15"	6'	6'6"	3'9"	20-25	6500	
2	20x12		45-55	40-50	30-40	1000	20"	15"	6'	7'6"	3'9"	30-35	7500	
3	30x16		65-80	60-70	45-60	1000	20"	15"	6'	8'6"	3'9"	50-60	9500	
4	40x18		100-115	80-90	60-80	1000	24"	18"	6'	9'0"	3'9"	75-80	10500	
5	50x20		120-140	100-110	75-100	1000	24"	20"	6'	9'6"	3'9"	100	12000	
6	60x20		150-175	115-130	100-120	1000	24"	22"	6'	11'0"	3'9"	125	16200	

JUMBO SPECIFICATIONS

5	30x24	R.O.M.	150-175	120-140	80-100	750	24"	18"	8'10"	9'	5'4"	85-100	20000
6	36x24		180-200	145-165	120-140	750	30"	20"	8'10"	10'	5'4"	140-150	24000
7	48x30		225-250	200-220	150-175	750	30"	24"	8'10"	11'	5'4"	165-185	28000
8	60x30		275-300	250-275	180-200	750	30"	24"	8'10"	13'	5'4"	200-250	30000

CRUSHERS FOR ANTHRACITE MINE REFUSE

Our Patent Hinged Hammer Debris Crushers are in extensive use for properly crushing and treating Anthracite debris or Culm before flushing it into the mines.

CRUSHERS FOR CHAIN GRATES OR STOKERS

The Williams Patent Coal Splitter takes Run of Mine Coal and reduces the same to $1\frac{1}{2}$ ", $1\frac{1}{4}$ ", 1", $\frac{3}{4}$ " and finer with the "minimum amount of fine dust," the only machine made that can be regulated to properly size coal. All parts are adjustable to wear; the crusher is also adjustable to give most any size coal desired.

BRIEF SPECIFICATIONS

No. of Crusher	Hopper Opening, Inches	Weight	Horse Power	Capacity—Tons Per Hour R.O.M. to $1\frac{1}{2}$ " and Finer
1	15x12	6500	15 to 20	25 to 40
2	20x12	7200	20 to 25	50 to 60
3	30x16	9500	40 to 50	75 to 100
4	40x18	10500	60 to 75	100 to 125
5	50x20	12000	85 to 100	135 to 175
6	60x20	16200	100 to 125	180 to 220

We also crush Coal and Pitch for Briquette Plants—for Coal Washers, before and after washing, and make a specialty of sizing Coal for all Commercial Purposes.

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

RAW MATERIAL GRINDERS FOR CEMENT AND GYPSUM PLANTS

UNIVERSAL MILL

This *Universal Grinder* is the *only* machine of its kind made. Will take DRY 2' Limestone, Shale, Clay, or Coal, and deliver at one operation a product 95% through 20 mesh TUBE MILL FEED WITHOUT OUTSIDE SCREENS OR SEPARATORS. *No other machine* can deliver the fine uniform product year in and out.



COMPLETE SPECIFICATIONS UNIVERSAL MILLS

Size Mill	Size Feed	Diam. Mill	Capacity Per Hour Dry Stone Tons		Speed R.P.M.	Horse Power	Floor Space Extreme Dimensions			Size Pulley		W'ght P'nds
			12 Mesh	20 Mesh			L'gth	Width	Height	Diam.	Face	
0	1"	18"	3/4	1/2	1800	10-12	5'	5' 1"	3' 2"	8"	8 1/2"	2500
1	1 1/2"	26"	2-4	1-3	1600	15-20	6' 3"	5' 10"	3' 8"	16"	10 1/2"	4000
2	1 1/2"	26"	5-6	3-5	1600	20-25	6' 3"	6' 3"	3' 8"	16"	12 1/2"	5000
2xx	2"	26"	6-8	5-6	1600	30-35	6' 3"	7'	3' 8"	20"	15"	6500
3	2"	40"	10-12	8-10	1100	50-60	7' 6"	6' 10"	5' 4"	20"	15"	12000
4	2 1/2"	40"	13-15	10-13	1100	65-75	7' 6"	7' 10"	5' 4"	20"	18"	14000
5	2 1/2"	40"	16-20	15-18	1100	80-100	7' 6"	8' 6"	5' 4"	20"	20"	16500
9	3"	60"	25-35	20-30	750	150-175	12'	9' 2"	7' 2"	30"	24"	30000

VULCANITE RE-CRUSHER

These Vulcanite grinders will take raw material, limestone, shale, clay or coal in cubes of 3 inches and under, and reduce the same to 1/2 inch or 1/4 inch. This makes an excellent feed for those plants which use roller mills as finishers in the raw end.

VULCANITE SPECIFICATIONS

Size Mill	Hopper Opening	Size Feed	Capacity Tons per Hour			Speed R.P.M.	Horse Power	Extreme Dimensions			Size Pulley		W'ght P'nds
			1/2"	3/8"	1/4"			L'gth	Width	Height	Diam.	Face	
1	14"x 5"	1 1/2"	4	3	2	1500	15-18	4' 8"	6' 3"	3' 3"	16"	10 1/2"	4200
2	18"x 6"	2"	7	5	3	1500	20-25	4' 8"	6' 6"	3' 3"	16"	12 1/2"	5000
2xx	24"x 6"	2"	10	8	6	1500	30-35	4' 8"	7'	3' 3"	20"	15"	6000
3	18"x 8"	2 1/2"	20	18	15	1000	40-50	5' 2"	7' 4"	4'	20"	15"	10000
4	24"x 8"	3"	30	27	25	1000	70-75	5' 2"	7' 4"	4'	20"	18"	12000
5	30"x 8"	3"	35	30	28	1000	90-100	5' 2"	8'	4'	20"	20"	14000
6	36"x 10"	3"	40	35	30	1000	110-125	5' 2"	9'	4'	20"	22"	15500
7	40"x 10"	3"	50	42	35	1000	125-150	5' 2"	9' 6"	4'	22"	24"	17500

We issue the following catalogs:

No. 45-E, Coal Crusher Catalog—For all those crushing and grinding coal, etc.
No. 45, Cement and Limestone Catalog—Limestone, Gypsum and Similar Grinders.

No. 45-B, Fertilizer Catalog—Bone, Tankage, Shells and Fertilizer Work.

No. 45-A, Clay Catalog—Clay, Shale, etc., for Brick, Tile and Terra Cotta.

No. 45-C, Oil Cake Catalog—Linseed, Cottonseed and Similar Oil Cake Grinders.

No. 45-F, Shredder Catalog—Bark, Chips, Cork and all Fibrous Materials.

No. 45-D, Stock Food Catalog—All Cereals for Feed Millers, Alfalfa, etc.

Mention material you wish to crush or grind and we shall see that you receive the proper catalog and specifications.



BRAEMER AIR CONDITIONING CORPORATION

(Formerly Air Conditioning Department of Warren Webster and Company)

MAIN OFFICES: LAFAYETTE BLDG., PHILADELPHIA, PA.

Manufacturers of Equipment for Maintaining Artificial Atmospheric Conditions in Industrial Plants; Dr. Hill Dust Counter—for Quantitative Determination of Air Dust; Generator Coolers; Webster Air Washers

TERRITORIAL REPRESENTATIVES

NEW YORK, N. Y., CHICAGO, ILL.

CLEVELAND, O. CINCINNATI, O. INDIANAPOLIS, IND. KANSAS CITY, MO. MILWAUKEE, WIS.



Webster Type "A"
Air Washer



Webster Type "B"
Air Washer



Braemer
De-Humidifier

THE WEBSTER TYPE "A" AIR WASHER

Designed primarily for air washing and cleansing in connection with heating and ventilating systems in public buildings, where a moderate cooling effect by evaporation is desired.

THE WEBSTER TYPE "B" AIR WASHER

Designed for air washing and cleansing in public buildings and industrial plants, where the greatest possible cooling effect by evaporation is desired.

BRAEMER HUMIDIFIERS & DE-HUMIDIFIERS

Designed for use in connection with humidifying, de-humidifying and low temperature drying installations for industrial processes of all descriptions.

BRAEMER SYSTEM OF AUTOMATIC HUMIDITY CONTROL

May be readily applied to the various types of Webster Air Washers and Braemer Humidifiers and De-Humidifiers.

Perfect in principle and accurate in operation among the distinguishing features may be mentioned:

1. Independent of unequal air and spray distribution and temperature, ordinarily causing unequal humidification, supersaturation, inaccurate results, etc.

2. Quick response—the chief controlling thermostat subject to water, a medium with four times the specific heat of air.

3. Inherently safe against over-humidification.

Consult us regarding Air Conditioning Apparatus for any purpose.

Catalogue sent
upon request.



Braemer
Generator Cooler

CARRIER ENGINEERING CORP'N

39 CORTLANDT ST., NEW YORK

Consulting, Designing and Contracting Engineers
Specialists in Air Conditioning and Drying

BRANCH OFFICES

BUFFALO, 1050 Ellicott Square
BOSTON, 176 Federal Street

PHILADELPHIA, Land Title Building
CHICAGO, Transportation Building

SERVICES AND PRODUCTS: Consultation Designs, Construction, Equipment and Installation, complete or in part, of plants for the purpose of Humidifying, Dehumidifying, Cooling, Air Washing, Automatic Temperature and Humidity Regulation.



TRADE MARK

EXPERIENCE AND CO-OPERATIVE SERVICE

Our claim to consideration is based upon extensive research and experimentation by America's pioneer engineers in these lines, upon long experience in design and installation, upon enviable records by hundreds of prominent installations made under our direction, and last, but not least, upon our eagerness to keep every client permanently pleased.

By securing our co-operation with engineers or architects on difficult air conditioning work, time and money are saved and protection furnished against faulty or unsuitable selection, and proportion of parts.

A conference between your engineers and ours may show big differences between what is now contemplated and what you should have.

The Carrier System Has the Flexibility to Meet Every Commercial Requirement in Air Conditioning.

Humidifying or dehumidifying alone.

Humidifying or dehumidifying with heating.

Humidifying or dehumidifying with cooling.

Humidifying with cooling in summer and heating in winter.

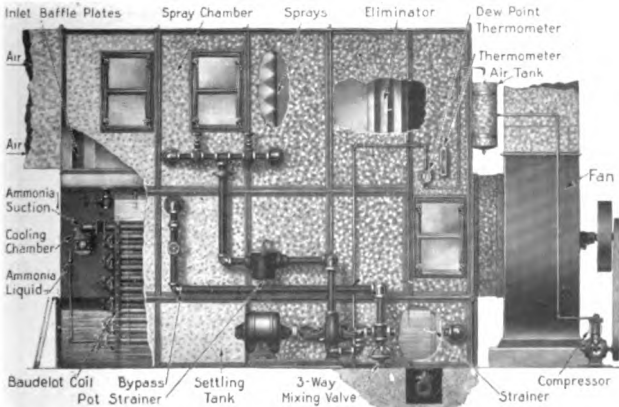
Humidifying with heating in winter and dehumidifying with cooling in summer.

Maintenance of uniform temperature or humidity or both.

Maintenance of uniform relative humidity.

Thorough Ventilation and Air Washing in All Instances.

The performance of every Carrier installation is guaranteed upon unmistakable terms, and if you will tell us about your air conditioning problems we will send instructive literature and give you some valuable suggestions.



Illustrating a Typical Carrier Installation

THE G. M. PARKS COMPANY

FITCHBURG, MASS.

BOSTON OFFICE:
1102 Old South Building

SOUTHERN OFFICE:
806 Commercial Bank Bldg., Charlotte, N. C.

Piping Engineers and Contractors

THE MERRILL PROCESS OF INDUSTRIAL HEATING

(Patents Pending)

A means for obtaining heat at high temperatures (600°) and low pressures for industrial processes. Superior to superheated steam, electricity or direct fire.

It Excels In

Quick Get-away—

No delay in picking up the load.

Constant Performance—

By maintaining uniform temperature and heat transfer.

Convenience—

No skilled supervision required. Design simplified.

Safety—

No fire hazard, no high pressures.

Durability—

No burn-outs, no leaky traps, no rust, every element accessible for easy cleaning or inspection.

Economy—

Low operating and fuel costs, combined with high efficiency and production.

Facilities—

Our commercial laboratory is available for experiment and assistance in determining design of special apparatus.

WE ALSO DESIGN AND INSTALL:

Turbo Humidifier systems.

The Turbo Psychrostat, or automatic humidity control.

The Turbo Oil Sprayer, for spraying water or oil on stock in process in textile mills.

Automatic Sprinkler systems.

Forced Circulation Hot Water Heating systems.

Mill and Power Plant Piping.

Piping Engineering work in old or new plants for the Conservation of Fuel.

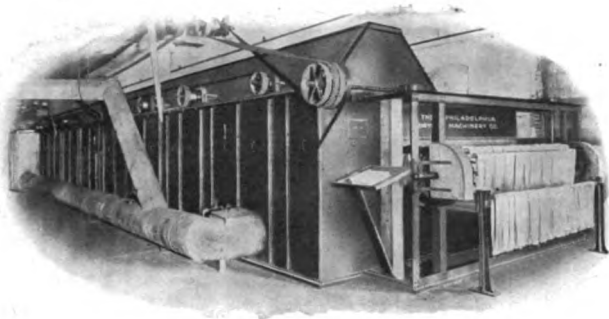
THE PHILADELPHIA DRYING MACHINERY CO.

MAIN OFFICE AND WORKS, PHILADELPHIA, PA.
STOKLEY ST., ABOVE WESTMORELAND

BOSTON OFFICE: 53 STATE ST.

Manufacturers of Dyeing, Bleaching and Drying Machinery

**Automatic
Yarn
Drying
and
Conditioning
Machine**



PRESSES { Hydraulic and
Power-Screw

BLEACHING AND DYEING MACHINERY

Complete Dyeing, Bleaching, Finishing, and Drying Equipments for Hosiery, Toweling and Underwear.

Circulating Dyeing Machines
For all kinds of Skein Yarn, Braid, Tape and Raw Stock

Rotary-Circulating Dyeing and Bleaching Machines for Hosiery give **The Best Dyeing at the Least Expense.**

*Complete information
and descriptive catalogs
sent upon request.*

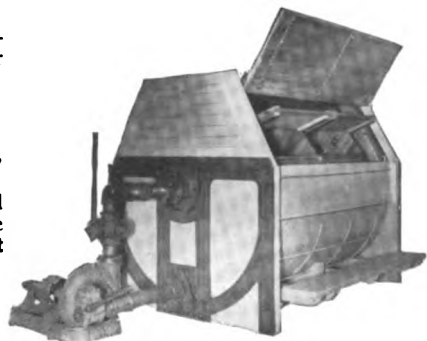
"HURRICANE" DRYERS

"Hurricane" Drying Machinery also includes: Automatic Loop Dryer for Underwear, Toweling, Piece Goods, Plushes; Automatic Raw Stock Dryer for Wool, Cotton, Linters, Hair, Flax; Continuous Piece Carbonizing Machine; Automatic Yarn Dryer, Truck Dryer for Yarn or Dyed Cones, Automatic Bag Dryers, Automatic and Drawer Type Hosiery Dryers.

Also Automatic and Truck Dryers for all forms of fibres and fabrics, leather, fibre board, tobacco, as well as fruits and chemicals; also **Special Dryers** for any material which can be dried with heated air.

Built in many standard sizes for any desired capacity. Write for illustrated catalogs.

State Material and Quantity.



Rotary-Circulating Dyeing and Bleaching Machine

THE PHILADELPHIA TEXTILE MACHINERY CO.

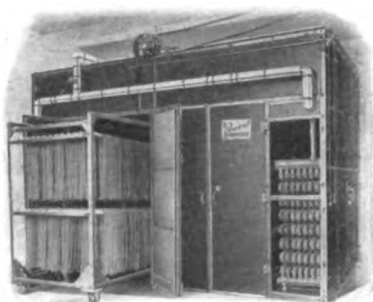
PHILADELPHIA, PA.

Providence, R. I.
422 Howard Bldg.

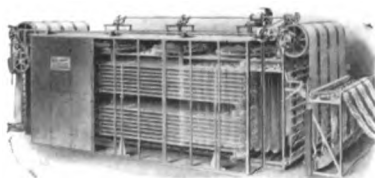
Charlotte, N. C.
H. G. Mayer
814 Realty Bldg.

Chicago, Ill.
812 Hearst Bldg.

Builders of Drying Machinery



**"Proctor" Truck Yarn Dryer for cotton,
woolen, worsted or silk
yarns**



**"Proctor" Automatic Loop Dryer for
knit goods, turkish toweling,
etc.**



**"Proctor" Automatic Yarn Dryer for
cotton, woolen, worsted or
silk yarns**

For

Efficiency—

Economy—

and Quality and Quantity of out-
put—

"Proctor"
DRYERS

have proven themselves unexcelled.

There are almost four thousand
"Proctor" Dryers drying all kinds of
materials in all parts of the world.

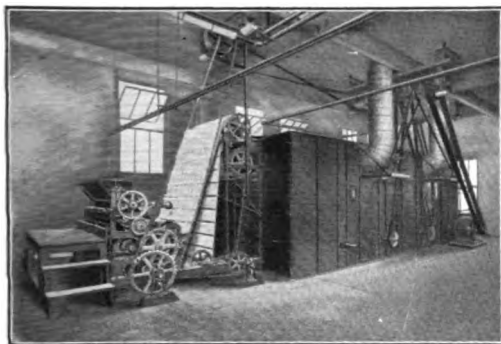
We are specialists in designing and
building drying machinery and study
each problem individually. Let us
send a "Proctor" Engineer to look
over your needs and make recom-
mendations. This will cost you noth-
ing.

Catalogues on request.



**"Proctor" Automatic Stock Dryer
for raw cotton, wool, hair,
rags, etc.**

THE PHILADELPHIA TEXTILE MACHINERY CO.



"Proctor" Automatic Soap Cooler, Crusher and Dryer for Chipped Soaps

If you are in need of drying machinery for any kind of materials we can help you.

We build

Proctor
DRYERS

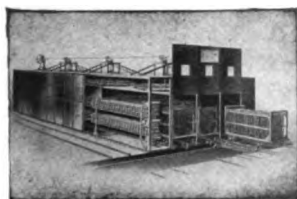
for



"Proctor" Dryer, truck tray type for Chemicals, Paint Colors, Lithopone, White Lead, Dry Colors, etc.

Hair
Leather
Hair Rope
Glue
Shoe Shanks
Leather Board
Binders' Board
Asbestos Board
Asbestos Pipe Covering
Paper
Tobacco
Soap
Veneers
Barrel Staves
Thin Lumber
Match Sticks
Tooth Picks
Wool
Cotton

Yarn
Chemicals
Lithopone
White Lead
Rags
Silk
Stockings
Knit Goods for Underwear
Turkish Towels
Felt Hats
Fur Hats
Straw Hats
Straw Braid
Welsbach Mantels
Cartridges
Potato Pulp
Paint Pigments
Labels on Cans
Bricks
Clay Products
Cloth
Cocoonut
Copra
Fruits
Vegetables
Window Screen
Cloth
Carpet



"Proctor" Hair-Rope Dryer



"Proctor" Stocking Dryer

SKINNER BROS. MFG. CO.

10TH & TYLER STS., ST. LOUIS, MO.

Manufacturers of Baetz Heating Systems, Drying Systems for All Purposes

BAETZ AIR-HEATING APPARATUS

The Baetz Patented Air Heating System is in successful operation in many of the largest foundries and industrial plants in the United States and it has been demonstrated time and again to be the ideal system for the heating of large exposed buildings.

We are willing at any time to back our judgment by placing BAETZ PATENTED AIR Heating Systems on trial for heating, drying or removal of steam, in any plant no matter how exposed it may be and we will guarantee satisfactory results or remove the system without cost.

Construction of the Baetz Heater

The Baetz Patent Air Heater is constructed of heavy steel plates and angles. The upper part is occupied by coils of steam pipe. The blower or fan is placed beneath them in the same enclosure.

The air is drawn in by the fan from two sides and is forced upward against the steam-heated coils, and passing out at the top as heated air. The fan does not handle the heated air, but takes the cold air as it passes directly into the blower.

The Warming System

The Baetz system of factory warming provides an even distribution of warmth throughout even the largest buildings, without the need of distributing pipes.

This result is possible of accomplishment only because the Baetz Air Heater draws the cool air in at the bottom and discharges it vertically through the heating coils. This causes a steady, though unnoticeable, movement of all the air within the room, the heated air constantly moving away from the heater and towards the walls, where it becomes cooler and falls, then is drawn back and into the blower to be heated again.

Various Uses of the Baetz Heating System

Some of the large packing houses and paper mills who are troubled with steam or vapor have them installed for the purpose of removing this difficulty. For drying purposes they are used in fire brick works, candy manufacturing concerns, shoe manufacturing concerns and others whose business requires a drying system.



Skeleton View of Baetz Heater

Special Features

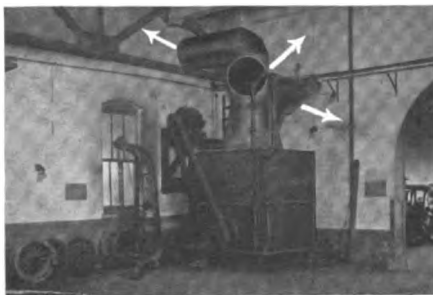
Live steam direct from boiler, or exhaust steam may be used.

Heater is shipped set up, ready for steam connection.

Floor space occupied is less than one-third of what any other system requires.

Low cost of maintenance and uniform heat distributed.

Units can be removed from place to place, as there are practically no pipes or distributing ducts used with our installation.



**Installation of Anheuser-Busch, St. Louis, Shows
Three Outlets Supplied from One Heater**

THE AUTOMATIC REFRIGERATING CO.

MAIN OFFICE AND WORKS, HARTFORD, CONN.

BRANCH SALES AND SERVICE OFFICES:

New York City
Boston, Mass.
Chicago, Ill.

San Francisco, Cal.
Los Angeles, Cal.
Seattle, Wash.

Washington, D. C.
Cleveland, Ohio
Louisville, Ky.

Atlanta, Ga.

Rochester, N. Y.

AUTOMATICALLY CONTROLLED REFRIGERATING AND ICE-MAKING PLANTS

These plants (fully patented) are designed to provide mechanical refrigeration without the necessity of an operating engineer. Automatic devices absolutely control starting and stopping of machine as temperatures in boxes rise above or fall below predetermined points, and also control ammonia expansion and feed of water to condenser. Safety devices immediately stop plant in case of trouble with water or electric power service.

Compressors: The compressors are of the vertical, two cylinder, single acting enclosed type of rugged construction built to gauge with parts interchangeable. They have safety heads, balanced suction valves and adjustable discharge valves. Cylinders and pistons are specially designed to prevent oil pumping into expansion piping. All wearing parts can be replaced at small expense from the large stock of parts always carried. Machines of this construction can never wear out, and can always be kept at the highest efficiency.

Compressor Capacities: Single units from 300 pounds to 32 tons Refrigeration per 24 hours.

Automatic Control: The control equipment is thoroughly reliable, and is rugged in construction.

Automatic Refrigeration originated with, and has been developed to its present state of perfection by this Company. These Automatic control devices are fully patented, and are manufactured exclusively by this Company, and installed only in connection with apparatus put out by this Company.

Thermostat: The Thermostat automatically controls the starting and stopping of the machine so as to maintain any desired temperature within a degree or two of a predetermined point. It insures that power is consumed only when the temperature requires it. As it is used with our automatic electric control panel, there is no arcing or pitting of the contact points.

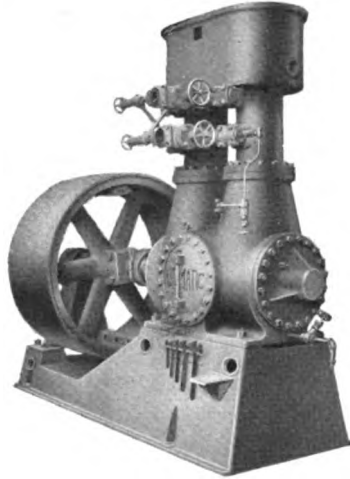
Automatic Switchboard: The starting and stopping of the motor by the various automatic devices are through a specially designed switchboard which has automatic safety devices that shut the machine down and cut off all power in the event of trouble in the electric service, preventing danger of damage to motor.

Automatic Expansion Valve: The Expansion Valve automatically controls the feed of ammonia to the expansion coils, thus maintaining the most economical pressure for the expansion of the liquid ammonia in the coils. It is easily adjusted, and functions perfectly.

Automatic Water Regulator: The Water Regulator automatically controls the flow of water to the condenser, and automatically adjusts the water use to the requirements of the plant. The action of the water valve is powerful and positive, and water waste is eliminated.

Automatic High Pressure Safety Cutoff: This device automatically stops the machine should the head pressure approach the danger point, due to failure of water supply or any other cause. It puts the plant in operation again when the cause of the high pressure is eliminated.

Repair Parts: All parts of the plant are of superior construction and are interchangeable.



477

able. A stock of parts is always carried which can be shipped promptly. No delay or holding up of apparatus while a new part is being constructed.

Advantages: The Automatic Refrigerating plant will produce refrigeration at a lower cost than any other electrically driven refrigerating machinery. The plant requires practically no attention other than occasional oiling and cleaning of the machinery.

The temperatures in any number of refrigerators can be maintained at any desired point by one plant. Air circulation in refrigerators is always lively as ammonia is always present in coils.

The many advantages of refrigeration by direct expansion can be fully realized through the Automatic plant. There are many Automatic plants cooling from ten to fifteen refrigerators at different temperatures on the one direct expansion system. The elimination of the cost of operating a brine pump and the extra equipment required for an indirect system, is possible only with an Automatic plant.

An Automatic plant can be located anywhere in a building without reference to the location of the engine room. This is an especially desirable feature for engineers designing equipment for factories and public buildings.

Engineers and Architects are urged to use the expert services of the Engineering Department of this Company to assist them in the solution of special problems in application of mechanical refrigeration. Factory drinking water, Restaurant and Commissary Department installations are applications whose possibilities are beginning to be appreciated.

THE H. B. SMITH CO.

WESTFIELD, MASS.

NEW YORK: 10 E. 39th Street

BOSTON: 138 Washington Street, North

PHILADELPHIA: 17th and Arch Streets

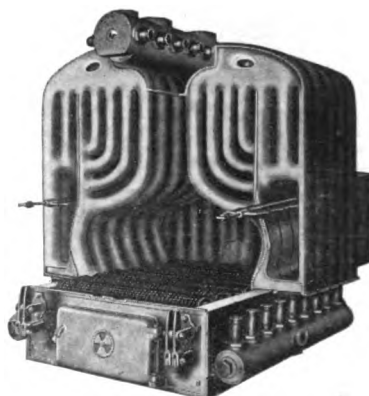
Manufacturers of Boilers and Radiators for Steam and Water Heating

MILLS WATER TUBE SECTIONAL BOILERS

A. S. M. E. Standard



No. 44 Mills Steam Boiler



No. 44 Mills Boiler—Interior

MILLS WATER TUBE BOILER

Size of Boiler	Nominal Width Fire Pot	Commercial Rated Capacity in Sq. Ft.		Max. Allowable Working Pressure Lbs. per Sq. In.		Hydrostatic Test Pressure Lbs. per Sq. In.
		Water	Steam	Water	Steam	
24	24	1500 to 3350	900 to 2025	50	15	125
34	34	3300 to 8575	2000 to 5200	50	15	125
44	44	5950 to 14850	3600 to 9000	50	15	125
48	48	7925 to 19800	4800 to 12000	80	15	200

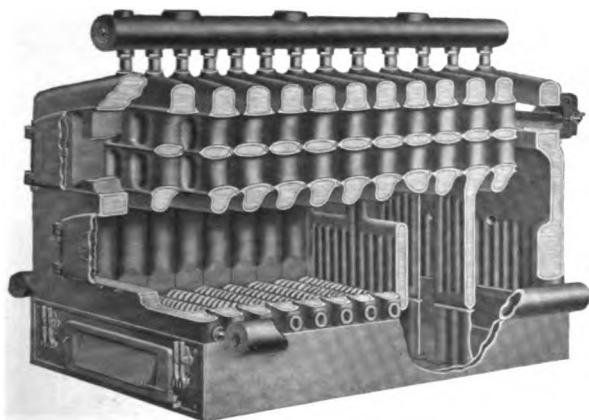
Send for bulletins and catalogues giving complete information.



THE H. B. SMITH CO.

SMITH SECTIONAL BOILERS

with or without Smokeless Furnace for Bituminous Coals



No. 36 Smith Boiler with Smokeless Furnace

Maximum Allowable Working Pressure—Steam 15 lb., Water 30 lb.
Tested at 60 lb. Hydrostatic Pressure, A. S. M. E. Standard
Catalogs on request

479

**DIRECT
RADIATORS**

Princess

Test at Factory } Two tests 100 lbs. water.
 } One test 80 lbs. steam.
Made in single, two, three and five column and wall radiators.
Send for complete Radiator Catalogue No. 1010.

SMITH SERVICE BOILER W-17

For Hot Water Supply

A. S. M. E. Standard.

Tested at 500 lb. Hydrostatic Pressure.

Maximum Allowable Working Pressure 200 lb.

Catalogs, bulletins and performance data of these and other service boilers will be sent upon request.

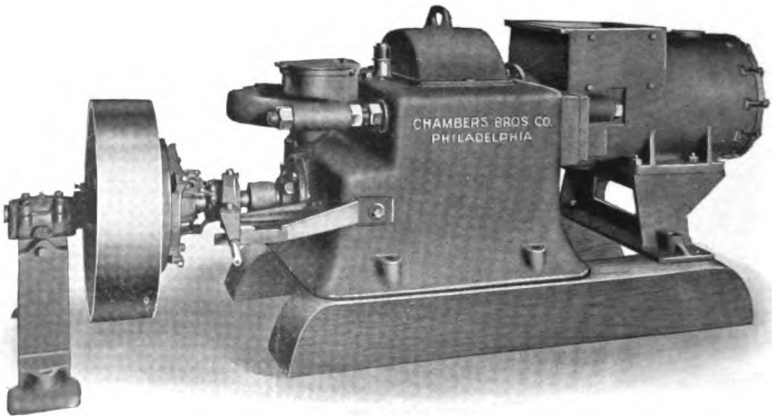


CHAMBERS BROTHERS COMPANY

PHILADELPHIA, PA.

AUGER MACHINES

For moulding and for compressing plastic materials.



Number 60 Extruding Machine

This particular machine has steam jacketed barrel, cast steel auger, forged steel die plate drilled with a large number of $\frac{3}{8}$ inch holes. The provision for end thrust is most liberal. Driving gears of steel with cut teeth and encased for constant lubrication. Friction clutch driving pulley 24 x 6 inches. Unboxed weight about 3550 pounds. Other patterns of barrel and of dies will be made to order.

We specialize on:

CLAY WORKING MACHINERY

BRICK MAKING MACHINES

BRICK REPRESSES

ROLLER CRUSHERS

BUCKEYE IRON & BRASS WORKS

DAYTON, OHIO

**Brass Goods for Engine Builders, Steam and Water Fitters
Tobacco Cutting Machinery, Linseed and Cotton Seed Oil Machinery
Castor and Coconut Oil Machinery a Specialty**

BUCKEYE

Extra Heavy Iron Body Throttle Valves

For High Duty Engines

High Grade Brass Goods

Globe Valves

Water Gauges

Angle Valves

Oil Cups

Check Valves

Air Cocks

Cross Valves

Cylinder Cocks

Radiator Valves

Steam Stops

Hot Water Valves

Unions

Brass, Bronze, Copper and Aluminum Castings

OIL MILL MACHINERY

Hydraulic Presses

Chilled Crushing Rolls

Automatic Steam, Hydraulic and Power Former

Attrition Mills

Disc Hullers

Cake Breakers

Mechanical Upright Cookers, full drop charge

Hydraulic Power Pumps

Accumulators

Change Cocks

Automatic Cake Strippers

Wave Line Grinding Plates

Brass and Steel Hydraulic Fittings

Sole Manufacturers of the Celebrated

PEASE TOBACCO CUTTING MACHINES

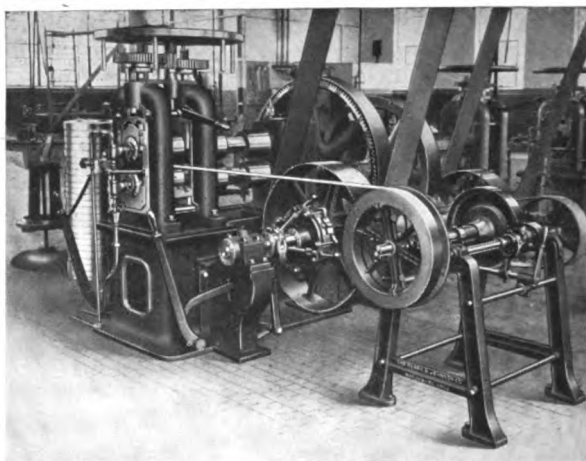
for cutting fine cut, smoking, cigarette and peccadura tobacco.

THE BLAKE & JOHNSON COMPANY

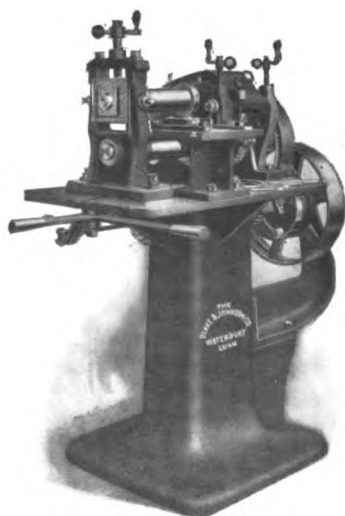
Established 1849

MACHINERY DIVISION
WATERBURY, CONN.

COLD ROLLING MACHINERY
For Steel, Brass, Copper, Etc.



**BUILDERS
OF
SLITTERS**



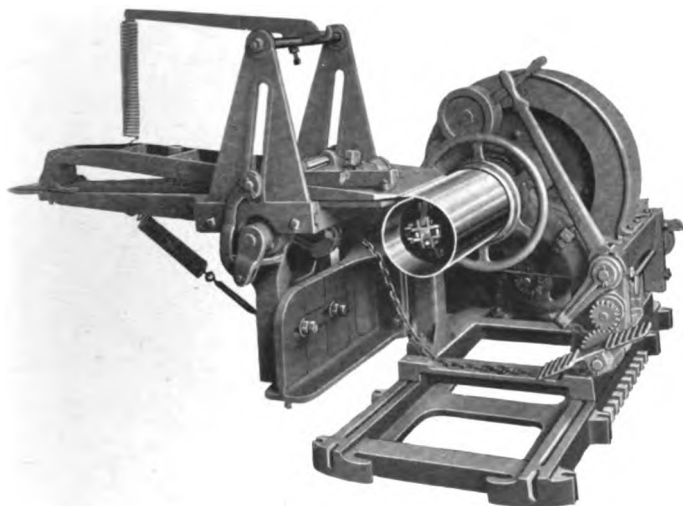
**SPECIALISTS
IN
MACHINERY
FOR
MANUFACTURING
METALS
IN
THIN GAUGES**

THE TORRINGTON MFG. CO.

Incorporated 1885

TORRINGTON, CONN., U. S. A.

Builders of Special Machinery for Brass and Copper Mills



483

THE ELECTRIC BLOCKER (Sundh Patent)

For automatically reeling, winding or blocking strip metal as it comes through the rolls.

The above machine is operated automatically by electric contact through the metal strip itself.

FEATURES. Safety to operator and machine. High Speed. Collapsible block. Capacity up to bending limit of metal. Skilled labor not required. Simple design. Adjustable tension.

THE ELECTRIC BLOCKER, although of modern design, has actually been in use for three years. Over 40 machines are already in successful operation.

SIZES. The machine will take thinner metal than any other blocker, as well as heavier sizes of Brass, Copper, Aluminum, Steel, German Silver, Nickel Silver and Cupro Nickel. The strips can be reeled as rapidly as it is possible to roll the metal.

Demonstrations are solicited.

NEW ENGLAND BUTT COMPANY

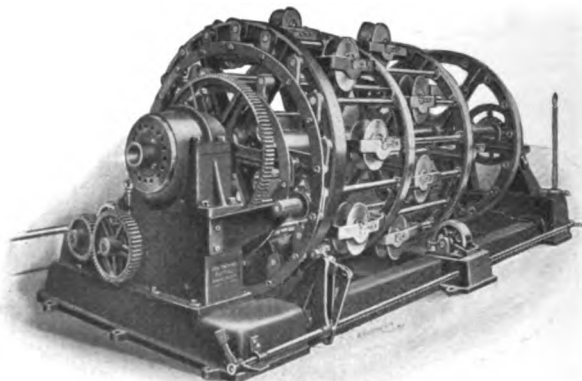
PROVIDENCE, R. I.

European Agents: Selson Engineering Company, Ltd., LONDON, ENGLAND

Manufacturers of Braiding Machinery; Machinery for Insulating Wires and Cables, also Machinery for the Manufacture of Wire Ropes and Cables

WIRE ROPE MACHINERY

Full line of high speed and planetary type machines. Closing Machines for wire rope.



Planetary Type Cabling Machine

BRAIDING MACHINERY

Used for making plain and fancy braids for dress trimmings and millinery, round and flat shoe laces, soutache braids, candle wicking, tapes, cords, banding, clothes lines, fish lines, packing, gas tubing and rubber hose, round and flat elastic.

Sash Cord Braiders for making solid sash and curtain cord of various sizes.

Sash Cord Finishers for polishing solid sash cord.

Silk Covering Machines for covering cotton with silk.

Rubber Spreading Machines, built of any desired width for applying a thin coating of rubber to cloth.

INSULATING MACHINERY

Single, Double and Triple Deck Braiders

These are made in all sizes and combinations for covering wires from small sizes up to large cables.

Magnet Wire Machinery for silk and cotton covering arranged to handle round and flat wires.

Annunciator Wire Winders, Single, Double or Triple Deck.

Taping Machinery for taping wires or cables with paper or other materials.

Polishing Machines, for insulated wires and cables from the small sizes up to 3" cables.

Wire Measuring Machines.

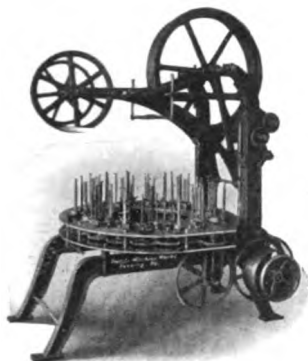
Twinning Machines.

Rubber Strip Covering Machines, for applying rubber insulation to wires and cables with either single or double seam. These machines are built in several sizes and handle from one up to twenty wires at a time.

TEXTILE MACHINE WORKS

READING, PA.

Manufacturers of Braiding and Insulating Machinery



Rubber Hose Braider

High Grade

BRAIDING MACHINES

for

Electrical Wires and Cables

and for making and armoring

Rubber Hose

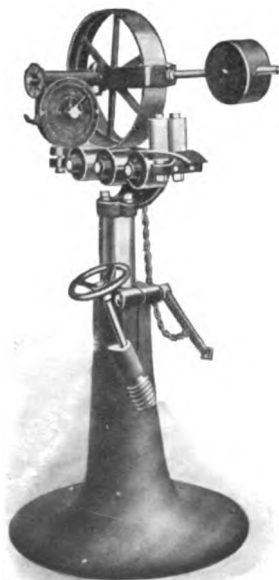
Packing Braiders

Take up Fixtures

Winders and Doublers

Measuring Machines

Etc.



**Measuring Machine for
Wires and Cables**

HIGH GRADE GRAY IRON CASTINGS

SLEEPER & HARTLEY, INC.

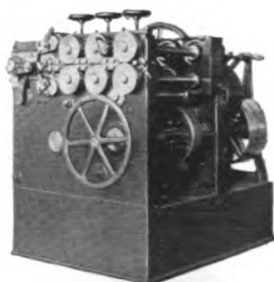
WORCESTER, MASS.

COATICOOK, P. Q., CANADA

Designers and Builders of High-Speed Automatic Wire Coiling Machinery



UNIVERSAL
SPRING
COILING
MACHINES



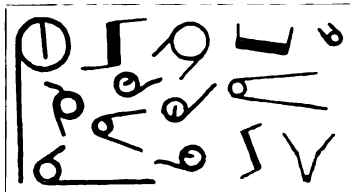
No. 3 Universal Coiler

Amongst the forty-odd, standard, spring makers' machines offered the trade for spring and wire coiling, spring setting, spring hooking, spring knotting, etc., the series of UNIVERSAL SPRING COILING MACHINES should be noted especially.

The machines of this type are designed to make complete, AND WITHOUT ANY TOOL CHARGE, all kinds of open-and-close-coiled wire springs. Right- or left-hand springs; straight, barrel-shaped, or tapered springs; springs with coned ends, or squared ends, can be produced.

The normal equipment of each machine is such that it will take, without change, all the wire sizes within its range; and will produce all the spring forms within its capacity, by merely shifting and adjusting the various working members.

These machines are now built in eight sizes, and are adapted to handle OIL TEMPERED WIRE from .004" to $\frac{3}{8}$ " diameter.



TORSION
SPRING
WINDING
MACHINES



Torsion Spring Machine

These machines are built in four sizes, handling OIL TEMPERED WIRE from .010" diameter to $\frac{3}{8}$ " diameter.

These machines operate automatically.

Spring forms may be wound right or left hand, and the lengths and angular relations of the projecting ends may be varied as desired; one end may be put across the coil; and in some cases bends may be made in the projecting ends.

WIRE NAIL MACHINES

These machines are a new development. Though small and compact, they are very powerful, the moving members operating in mechanical balance with ease and smoothness at exceptionally high speeds.

No rotating cams are used—all the working motions being accomplished by means of toggle joints—with a practically noiseless result.

The power is expended in making nails—not noise—and the consequent wear and tear upon the machine is enormously reduced.

The pointing and heading operations are separated, the heating effect upon the dies being thereby greatly reduced, and the working stresses much more widely distributed.

Other notable features are the accessibility of these dies, and the manner in which their adjustment is accomplished; compensating wedges are provided to take up wear throughout the machine.

These machines are built in five sizes, handling wire from No. 17 (.054") to $\frac{3}{8}$ ", and making nails from $\frac{3}{4}$ " to 10" in length.



Wire Nail Machine

In addition to the machines described or mentioned above, we offer the following:
HIGH SPEED WIRE STRAIGHTENING AND CUTTING MACHINES.
MUSIC WIRE STRAIGHTENING AND BUNDLING MACHINES.
TUNGSTEN FILAMENT COILING MACHINERY.
FLEXIBLE SHAFT COILING MACHINES.
FLEXIBLE CASING COILERS.
FLEXIBLE METALLIC TUBE COILING MACHINES (IN 2 SIZES).
DOUBLE POINT TACK MACHINES, ETC., ETC.

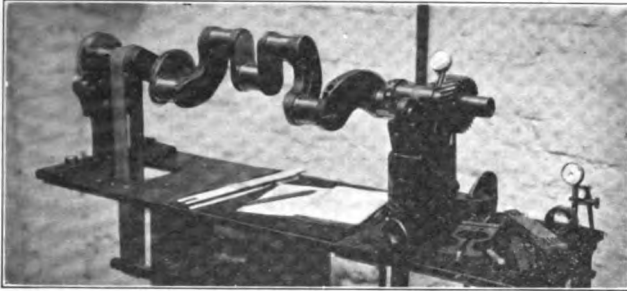
VIBRATION SPECIALTY CO.

HARRISON BLDG., PHILADELPHIA

N. W. Akimoff, Eng. and Mgr. Positively not connected with any other concern

**Manufacturers of Balancing Machinery, Static and Dynamic
Laboratory of Practical Balancing—Latest Methods**

VIBRATIONS—OUR SPECIALTY



Balancing a Six Throw Crankshaft According to Mr. Akimoff's Latest Methods, Observe that the Plane of Unbalance Can Come anywhere, Not Only in One of the Three Crank Planes

Without perfect static balance no perfect dynamic balance can be secured.

Perfect static balance cannot be secured on parallels, but only by some method involving actual rotation.

487

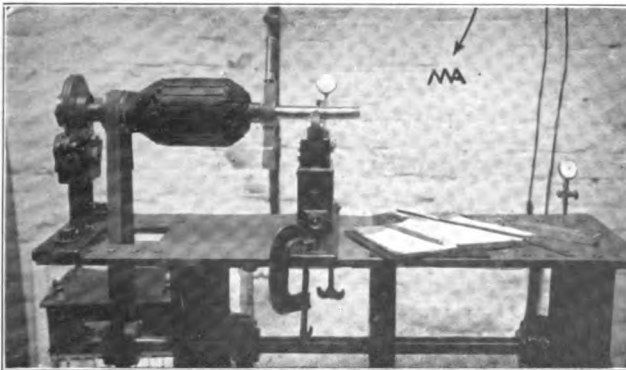
We manufacture Balancing Apparatus of Mr. Akimoff's latest designs.

We study and report on all problems, involving vibratory motion.

We are prepared to *balance rotors of all kinds and sizes*; in the field or on owner's premises, if very large; or in our Laboratory, in this city.

We advocate *standardized balance*, with definite balancing tolerances, in order to put an end to the present chaotic state of affairs in this connection.

All work is being done under personal supervision of Mr. Akimoff, whose initials are our trade mark, **MA**



Balancing an Armature by Our Latest Methods, A Great Variety of Articles, Much Smaller as Well as Much Larger than This Armature, Have Been Placed in Perfect Balance on This Very Machine

THE SANDUSKY FOUNDRY & MACHINE COMPANY

SANDUSKY, OHIO

SEAMLESS FLUID-COMPRESSED TUBING

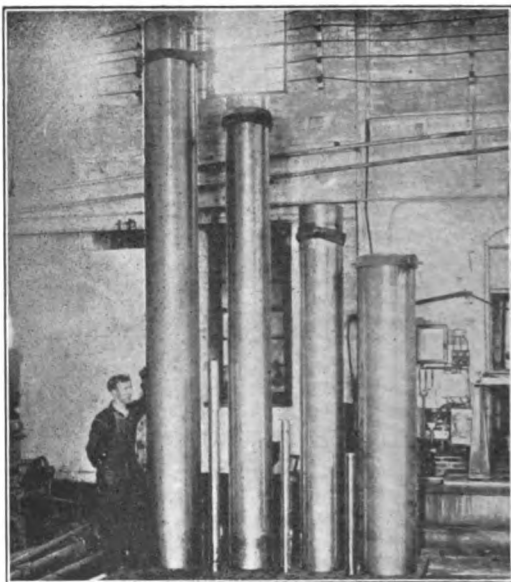
of Brass—Bronze—Gunmetal

For
Propeller
Shaft
Sleeves

—
Press
Liners

—
Pump
Liners

—
Roll
Covers



Homogenous and Close Grain.

Greater Tensile Strength.

Higher Elongation.

Free from surface defects.

Liners and sleeves furnished completely machined.

BLAW-KNOX COMPANY

PITTSBURGH, PA.

Manufacturers of Steel Products

DISTRICT SALES OFFICES:

NEW YORK CITY
165 Broadway

SAN FRANCISCO, CAL.
Rialto Building

CHICAGO, ILL.
Peoples Gas Bldg.



"BLAWFORMS"

For All Kinds of Concrete Construction

Aqueducts, Arches, Blocks, Bridges, Caissons, Cisterns, Cofferdams, Columns, Conduits, Culverts, Curbs, Drain Tile, Draft Tubes, Floors, Foundations, Grain Bins, Gutters, Houses, Integral Curb and Base Construction, Manholes, Monolithic Road Construction, Piers, Pipe, Reservoirs, Roads, Sewers, Shafts, Sidewalls, Subways, Tanks, Towers, Tunnels, Viaducts, Walls, Warehouses, Etc.

THE "BLAW-RANSOMIXER"

A 10 cu. ft. capacity mixer that will mix 40 or more batches, 10 or more cu. yds. of uniform concrete per hour.

"BLAW" BUCKETS

For All Classes of Service

Clay, Cinder, Coal, Gravel, Ore and Soil Handling; Digging, Dredging, Excavating. Cable Way Carriages. Holding Drums.

"BLAW" FABRICATED STRUCTURAL STEEL

Bridges, Buildings, Manufacturing Plants, Mill Buildings, Poles, Trusses.

"BLAW" TRANSMISSION TOWERS

STEEL PLATE WORK

"KNOX" PRESSED AND WELDED STEEL CONSTRUCTION

Annealing Boxes and Pots, Digesters, Galvanizing Pots, Gas Containers, Oil Filters, Palm Oil Melting Plants, Riveted Pipe, Spelter Pans, Storage Bins, Tanks of All Kinds, Water Boshes, Water Gas Welding.

"KNOX" WATER COOLED FURNACE EQUIPMENT

Buckstays, Doors, Door Frames, Floors, Ports, Reversing Valves, Shields, Skewbacks, Bulkhead Coolers.

AMERICAN TOOL & MACHINE CO.

Established 1843

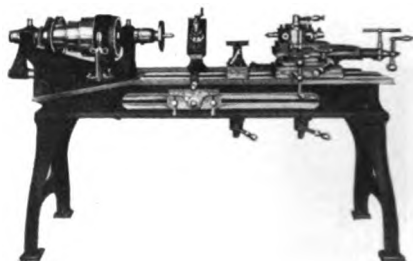
BOSTON

Incorporated 1864

FOX BRASS FINISHERS' LATHES

Patented and introduced in 1857.

A constantly increasing demand
for sixty years.



WESTON CENTRIFUGALS

Patented and introduced in 1864.

First developed for sugar and modified to meet every demand requiring centrifugal process.

- 5 inch diameter hand power.
- 10 inch diameter belt or motor for laboratory.
- 30-36-40 inch for sugar and chemicals.
- 20 inch diameter drying small pieces
and up to
- 54 inch diameter hydro extractor.



ROPER OIL SEPARATOR

For saving oil from chips and turnings.

Built for more than forty years with a larger demand than ever.

BELT KNIFE LEATHER SPLITTING MACHINE

Splitting is the most profitable process in leather manufacture.

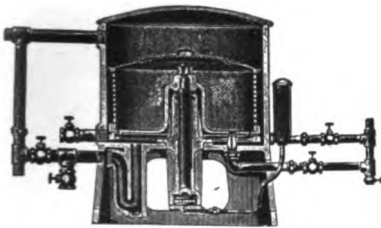
POWER TRANSMISSION MACHINERY

Friction clutches and all specialties.

THE OIL AND WASTE SAVING MACHINE COMPANY

1509 REAL ESTATE TRUST BLDG., PHILADELPHIA

Manufacturers of Machinery for Separating and Reclaiming Oil and Waste, Centrifugal Oil Filters, Oil Extractors for Cleaning Oily Chips



Waste Machine

IMPROVED WASTE MACHINE

The basket or waste receptable in the machine is driven by direct connected steam turbine, which exhausts into the basket, heating and liquefying the oil and grease, which is extracted from the waste, towels or rags by centrifugal force. The machine is then filled with water, and the waste, towels or rags thoroughly washed and sterilized, after which same is dried by the machine for future use.

Guaranteed saving of 90% of the oil and all of the waste. Requires little attention. Over 3,000 machines in use. Made in 10", 15", 20" and 36" sizes with respective capacities of $\frac{1}{2}$ cu. ft., 1 cu. ft., 2 cu. ft., and 8 cu. ft. of waste rags or machinery towels per charge.

TURBINE CENTRIFUGAL SEPARATOR

For Extracting Oil from Metal Turnings

This Machine is steam turbine driven and the heat from the steam coming into contact with the oily chips and turnings, aids the centrifugal action in producing an absolute oil extraction not procured with ordinary belt driven Separators. Machine can be operated with air. All belting and countershafting troubles and cares are entirely eliminated.

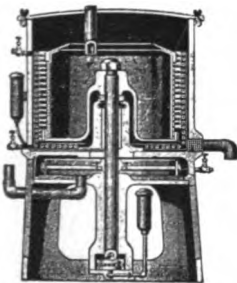
The Basket capacity of this Machine is 8 cu. ft. making it especially adaptable for the handling of long, curly and bushy turnings.



Turbine Centrifugal Separat

TURBINE CENTRIFUGAL OIL FILTER

Will remove all foreign matter. all moisture or emulsion from and sterilize the oil. Driven by direct connected steam turbine. The filter requires very little steam to operate same, owing to its design and its being equipped with a ball step-bearing; requires little care in operation and has practically no wearing parts.



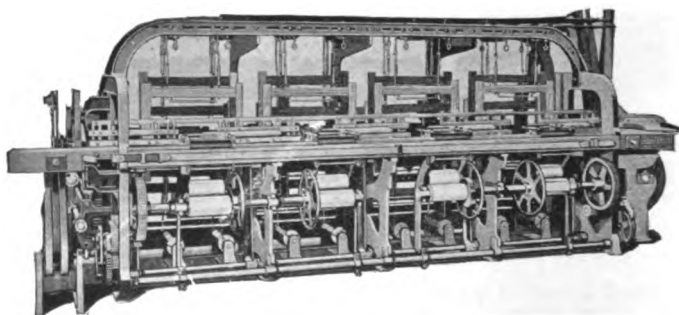
Centrifugal Oil Filter

SPECIFICATIONS

Size	15"	20"
Base measurements.....	21"x21"	27"x27"
Height.....	30"	40"
Weight.....	450 lbs.	800 lbs
Steam pressure required to operate.....	20 lbs.	40 lbs.
Steam consumed per hour of operation.....	83 lbs.	138 lbs.
Oil filtering capacity per hour.....	20 to 30 gals.	50 to 60 gals.

SCHAUM & UHLINGER, INC.

GLENWOOD AVE. AT SECOND ST.,
PHILADELPHIA, U. S. A.



Cotton Belting Loom

The massive construction of this loom gives assurance that in every operation, it possesses the ruggedness necessary to weave belting and heavy webbing.

Arranged for either belt or motor drive.

LOOMS FOR WEAVING

Ribbons

Novelties

Tapes

Labels

Trimmings

Webs

Brake Lining

Belting

Hose

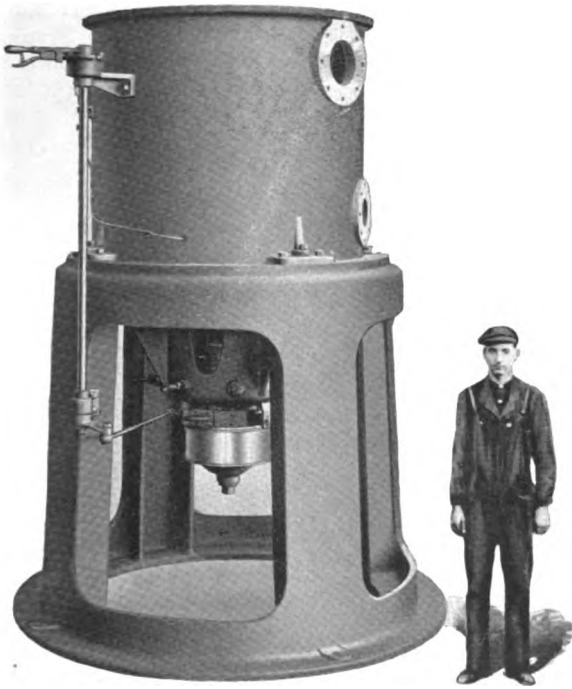
SCHAUM & UHLINGER, INC.

GLENWOOD AVE. AT SECOND ST.,
PHILADELPHIA, U. S. A.

Eastern Agent
Western Agent

Southern Agent
Southern Rep.

CENTRIFUGAL MACHINES



Underdriven Nitrocellulose Dryer

Separation or extraction by means of centrifugal force.

Extraction from the goods of the liquids used in dyeing, bleaching, rinsing and drying of fabrics and fibres.

Extracting and washing of chemicals.

Precipitating solids from or clarifying liquids.

Our laboratory is at your disposal for the study of your problems involving the use of centrifugal machines.

L. O. KOVEN & BROTHER

OFFICE: 154 OGDEN AVE., JERSEY CITY, N. J.

N. Y. WAREROOMS
50 Cliff Street, NEW YORK CITY

WORKS
JERSEY CITY, N. J.

Engineers, Manufacturers, Machinists and Designers. We Fabricate Plate Steel, Copper, Brass, Tin, Aluminum, etc., of Any Shape. Designers and Makers of Special Apparatus for Manufacturing Industries

We are prepared to do plate work of every description for Ships, Mills, Mines, Factories, Plantations, Chemical Works, Paint Works, Paper Mills, Abattoirs, Fertilizer Plants, Water Works, Government Work, Sewage Systems, etc. We also make and design Special Apparatus and Machinery to meet the progress in all lines of business. *WE HAVE THE FACILITIES FOR IMPROVING YOURS.*

A Partial List of What We Make

AIR WASHERS	KILNS
ALCOHOL RECOVERY AND PURIFYING APPARATUS	LEAD LINED TANKS
ALCOHOL STILLs	MALT TANKS
AUTOCLAVES	METAL MELTING FURNACES
BOTTLE STERILIZERS	MILK MACHINERY
BREAD RACKS	MIXERS
CANS	MUFFLERS
CAN WASHERS	OIL FILTERS
CANNED GOODS STERILIZERS	OIL WASHERS
CHEESE VATS	OYSTER WASHERS
CHINA KILNS	PASTEURIZERS
COIL BOILERS	PERCOLATORS
CONDENSED MILK COOLERS	PIE RACKS
COPPER LINED STEEL TANKS	PIPE (RIVETED)
CREOSOTING TANKS	PLATING TANKS
DIGESTERS	RUBBER LINED TANKS
DRINKING GLASS STERILIZERS	SAND BLAST TANKS
DRYING APPARATUS	SHIPPING DRUMS
EXHAUST MANIFOLDS	SPRAYERS, FRUIT TREES
EXTRACTORS	SPRAYERS, PAINT
FILTER PRESSES	SOLVENT RECOVERY STILLs
FRUIT WASHERS	STEAM KETTLES
GALVANIZED TANKS	STERILIZERS
GASOLINE TANKS	STILLS
GASOMETERS	SMOKE STACKS
GLASS KILNS	TANKS (AIR, GAS, OIL, AND WATER)
GLASS STERILIZERS	TUMBLERS
GLUE DISSOLVERS	VACUUM PANS
GUM WASHERS	VARNISH TANKS
HAM BOILERS	VEGETABLE WASHERS
HOT WATER TANKS	VULCANIZERS
HUMIDIFIERS	WASHERS FOR CANNERIES
JACKETED TANKS	WATER STILLs

MORRISON BROS.

Established 1865

DUBUQUE, IOWA

Steel Tanks for All Purposes

Hydro-Pneumatic Pressure Tanks, Hot Water Storage Tanks, Air Pressure Tanks

Morrison tanks that are subjected to internal pressure are riveted and brazed. In the brazing process the seam is riveted merely to hold the plates together and the copper brazing compound is sweated or flushed into the seam, forming a perfect bond between the plates. No caulking is required as every minute opening between the plates and around the rivets is completely filled with the brazing compound.

The heads on all pressure tanks are welded as are also the circular seams on long tanks.

For regular work, tanks are tested under air pressure.

Septic Tanks

Morrison Septic Tanks are welded throughout. They successfully dispose of the sewage problem for homes situated away from regular sewage systems.

OIL TANKS for Motor Trucks and Wagons

Morrison Tanks to be mounted on trucks or wagons for the transportation of oils are made up of two or more separable compartments. Each compartment is welded and tested separately and then mounted on wooden sills and blocks. The finished tank, complete with bucket box, top-rack or side-racks, is shipped ready for mounting on a truck or wagon.

Underground Storage Tanks

Morrison Underground Tanks are made of heavy plate, welded throughout and bear the Underwriters' labels.

Gasoline Filling Station Pumps

Two styles of station pumps are made: the Self-Measuring, which delivers one gallon or any part of one gallon per stroke, and the Visible Pump which is arranged with a 20 gallon feed tank above the pump and is provided with a gauge glass which shows the customer the exact amount of gasoline delivered to his car.

Morrison Self- Lubricating Tank Wagon Faucets

The Morrison Self-Lubricating Faucet is provided with a chamber for a special lubricant which automatically keeps the plug lubricated, and, on account of its being impervious to oils, prevents leakage.

Tank Wagon Air Vents

Morrison Double Acting Air Vents are provided with ball valves which automatically permit air to pass into the tank or pressure to be released as required. When used on truck tanks the vent is automatically closed and prevents leakage in case the tank is overturned.

Station Tank Air Vents

Large air vents are required on station oil tanks to permit air to pass in and out freely when drawing off or filling. Morrison vents are made of brass and are designed to work automatically and easily.

Automatic Barrel Fillers

The Morrison Automatic Barrel Filler is provided with a float valve which closes automatically when the barrel is filled to the desired point.

Relief Valves

Morrison valves are made of brass throughout and are provided with means of adjustment to maintain pressure desired. Valves are provided with a lever so that they may be tested daily.

Special Tanks

Prices of special tanks will be quoted on request.

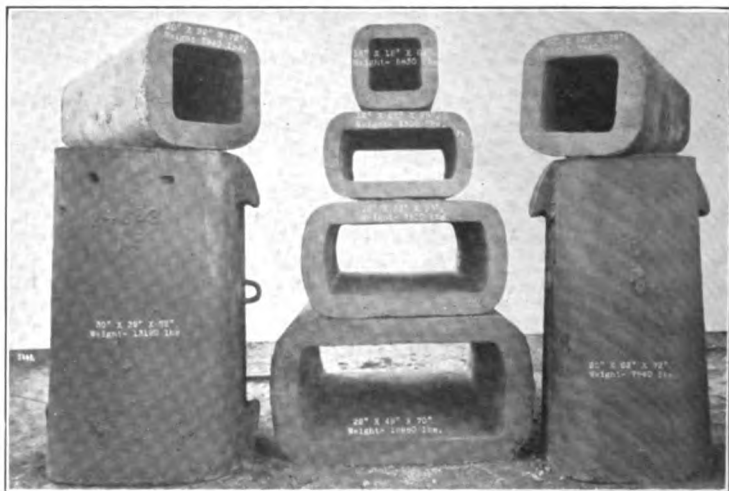
THE MARSHALL FOUNDRY CO.

OFFICE: 1ST NAT'L BANK BLDG.,

PITTSBURGH, PA.

WORKS: JOSEPHINE, PA., AND PITTSBURGH, PA.

Ingot Molds and Grey Iron Castings



496

INGOT MOLDS

Made from direct furnace or remelted *Standard Bessemer Pig Iron*.

CAPACITY 1000 TONS DAILY

ALL SHAPES

SQUARE

SLAB

OCTAGON

ROUND

CORRUGATED

ALSO SPECIAL SHAPES

We have Patterns for sizes used in general mill practice.

PHOENIX IRON WORKS CO.

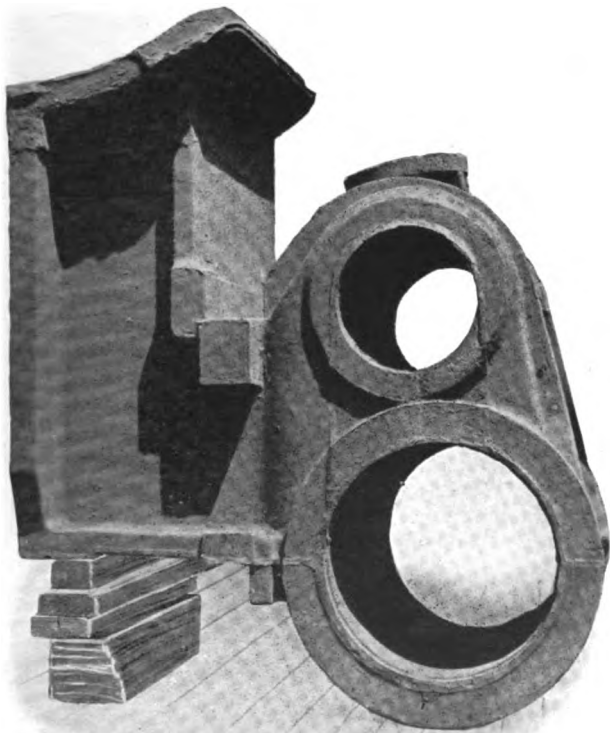
Established 1865

MEADVILLE, PA.

BRANCH SALES OFFICES

PHILADELPHIA, PA.
913 Harrison Bldg.

PITTSBURGH, PA.
601 Granite Bldg.



497

LOCOMOTIVE CYLINDERS A SPECIALTY

Manufacturers of

BOILERS

STACKS

BREECHINGS

TANKS

PLATE WORK—RIVETED & WELDED

IRON CASTINGS

ENGINEERS & MACHINISTS

Inquiries Promptly Attended to



WM. B. SCAIFE & SONS CO.

Founded 1802

PITTSBURGH, PA.



Copper-Brazed COMPRESSED AIR TANKS

These tanks are made only by
Wm. B. Scaife & Sons Co.

The Scaife Brazed Tanks are unequalled by any other style of construction for containing air under pressure. We positively guarantee these tanks will hold air indefinitely without loss of pressure.



Plate H-10

The copper-brazed seams are actually the strongest parts of the tank. We have repeatedly proved this by actual tests to destruction.

Pressure Tanks for All Purposes.

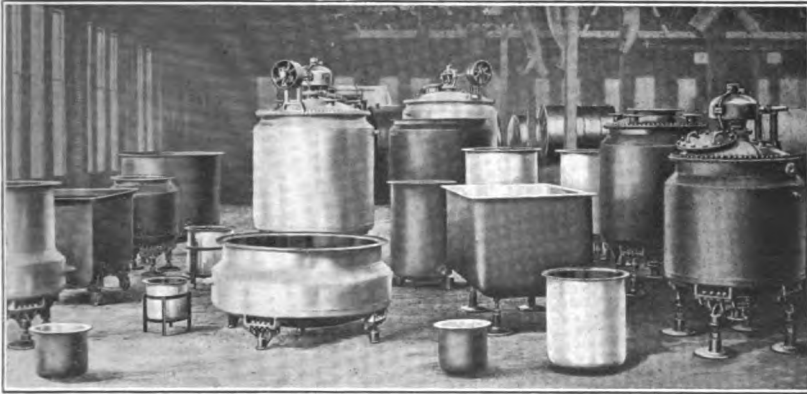
THE PFAUDLER CO.

ROCHESTER, N. Y.

NEW YORK	CHICAGO	SAN FRANCISCO	PITTSBURGH
110 West 40th Street	1442 Conway Bldg.	512 Sharon Bldg.	602 Oliver Bldg.
BOSTON	DETROIT	ST. LOUIS	
921 Oliver Bldg.	1946 Penobscot Bldg.	440 Pierce Bldg.	

PFAUDLER GLASS ENAMELED STEEL TANKS AND APPARATUS (For Corrosive or Sensitive Liquids)

include Kettles, either jacketed or plain; Mixing Tanks, with Agitators of various types; Stills, with or without Enameled Condensers; Evaporating Pans, for vacuum or atmospheric pressure; Storage and Car Tanks; and Specially Designed Apparatus. These are built of open hearth steel, rolled, pressed and welded to shape, and lined with Glass Enamels developed by ourselves, of exceptional resistivity to corrosion, density and tenacity. We fuse our Glass Enamels into the steel at great heat, by the process which we originated over thirty years ago.



499

Pfaudler One-Piece Tanks, Kettles, etc., are welded throughout by the most highly approved methods, and may be either open or closed, jacketed or plain, with enameled nipples, either flanged or threaded, placed as required.

Sectional Tanks, lined with our Resistive Glass Enamels, consist of rings and heads, securely bolted together, with joints sealed by gaskets of suitable materials. Because of their practically unlimited capacity these sectional tanks are used all over the world for the storage of liquids. In smaller apparatus, a combination of welded and bolted construction often presents desirable advantages.

Agitators and Other Fittings: Our Glass Enameled Steel, vertical propeller type agitators are very efficient in corrosive work. For materials which will not attack silver-plated, tinned or plain brass or steel, we build agitators of those metals for single or double motion in propeller type (with or without drum) or "sweep type," which are very serviceable. A propeller type agitator set horizontally into the side of a tank near the bottom provides excellent circulation; and we have designed a small, adjustable agitator which can quickly be attached to the rim of an open Pfaudler tank or kettle, and which gives remarkably good results. Our Enameled Steel Catsup Kettles, equipped with "flash" steam coils, are being successfully used in many prominent preserving plants.

Uses: Food Products, such as Soups, Extracts, Sauces and Dressings, Preserved Fruits, Syrups, etc.; Heavy and Pharmaceutical Chemicals; Beverages; Fluid and Condensed Milk; Ice Cream; Sanitary Water Storage; in short, the preparation and storage of almost all liquids and semi-liquids requiring non-corrodible or sanitary containers of large capacity. We also build the Pfaudler Glass Enameled Steel Laundry Chute—absolutely sanitary—for Hospitals, Hotels, etc.

HODGES WATER STILL CO., INC.

1234 CALLOWHILL St., PHILADELPHIA, PA.

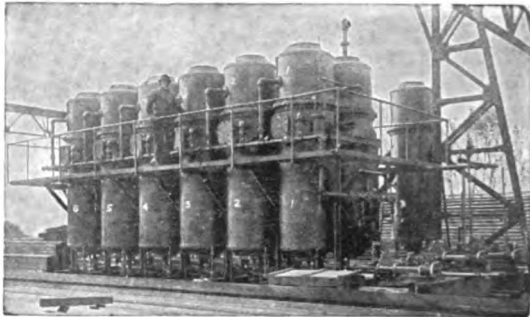
Manufacturers of Single and Multiple-Effect Water Stills, Salt Water Evaporators and Distillers, Brine Concentrators, and Feed Water Heaters

THE MULTIPLE-EFFECT STILL is the ONLY economical method of producing large quantities of distilled water at low cost.

The greater the number of effects, the greater the economy in fuel consumption.

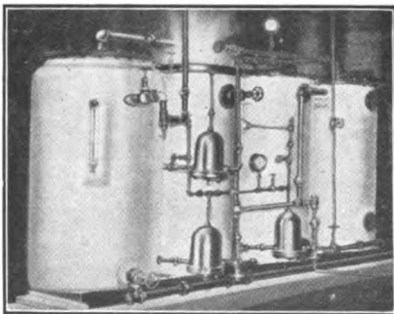
Every gallon of condensing water that goes into the still turns out a gallon of distilled water.

No heat is wasted by the Hodges Method. It will produce more distilled water for each pound weight of steam than any other on the market.



Hodges Multiple-Effect Stills

Built in any capacity desired. In 4, 6, 8, 10 or 12 effects.



Typical Hodges Two-Effect Still

Built in capacities of fifty gallons an hour and upward.

HODGES TWO-EFFECT STILLS will produce twice as much distilled water for each pound weight of steam delivered to the still as any apparatus of the same capacity on the market.

The saving in coal over a single-effect will almost pay for the apparatus in one year's time.

Easy to operate and clean.

Do not scale readily.

All Hodges Stills are readily accessible for easy and quick cleaning.

Hodges Stills produce the highest possible grade of distilled water, both as to purity and palatability.

No aeration of other treatment required.

Ideal for drinking, surgical, technical, manufacturing and chemical purposes, where purity is the first requisite.

Several hundred in use in the United States.

ASK US FOR FACTS

Write us for full information of the Hodges Single- and Multiple-Effect Stills, also on Brine Concentrators, Salt Water Evaporators and Distillers, and Feed Water Heaters.



SWENSON EVAPORATOR COMPANY

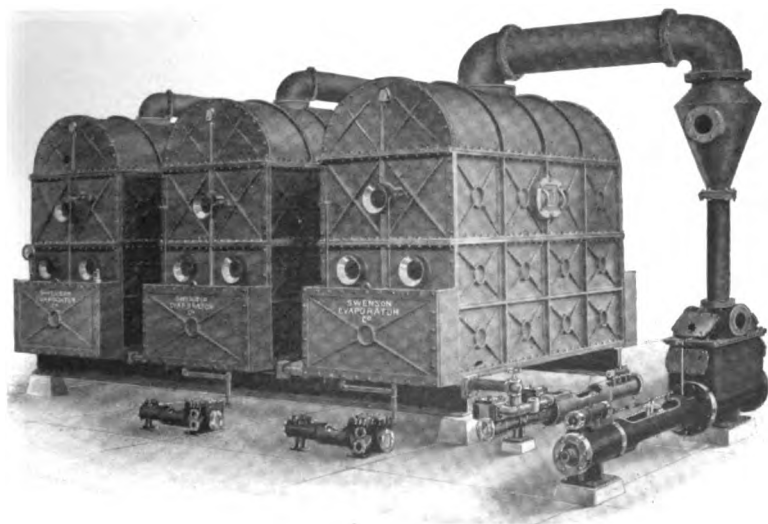
945 MONADNOCK BLOCK, CHICAGO

CABLE ADDRESS: EVAPORATOR, CHICAGO

PRODUCTS: Evaporators, Single and Multiple Effects; Vacuum Pans; Leaching Batteries; Beet Sugar Machinery; Pulp Mill Machinery; Special Chemical and Waste Product Machinery.

SUBSTANCES HANDLED: Any liquor condensed in commercial quantities.

SIZES OF EVAPORATORS: Sizes regularly range from 100 to 10,000 gallons per hour evaporation.



501

TYPES OF EVAPORATORS: We manufacture five standard types of evaporators; however, when our regular types do not meet the conditions efficiently, our Engineers evolve special types or combinations of types to produce the desired results. Our Catalogue on Evaporators deals with Type in detail.

SWENSON SERVICE: Economy, durability, accessibility, low repairs, easy operation and maximum simplicity in design, consistent with the attaining of these results, characterize Swenson Service. We can refer to more than 1000 evaporator installations over half of which have been repeat orders. More than a quarter of a century of experience is at your command.

SPECIALISTS: Specialists in processes utilizing waste solutions or new chemical products.

CATALOGUE: Our Catalogue contains valuable information and tables as well as descriptions of our machines.

JARVIS ENGINEERING CO.

261 FRANKLIN ST., BOSTON, MASS.

Manufacturers of Incinerators, Destructors and Special Furnaces

Products

Garbage and Refuse Destructors.
Industrial Waste Disposal Plants.
Municipal Refuse Reclamation Stations.

Incinerators.

Also, Mortuary Crematories.

Scope of Use

For the complete and sanitary disposal of garbage, refuse and rubbish. Heat may be utilized for generating steam where desired.

Used by municipalities, hospitals, colleges, institutions, manufacturing plants, hotels, etc.

Capacity

Units of standard design vary in capacity from 150 to 2000 lbs. per hour. Special designs furnished to suit space available.

Plants built in single or multiple units.

Construction

Units built of heavy masonry walls substantially braced and supported with steel. Built with steel casing if desired. Special fire brick lining throughout.

Arranged for top or end charging, and end or side firing and stoking.

Operation

No special preparation of the material to be destroyed; operation fully guaranteed. When a supporting fire is needed, oil, gas, coal or wood may be used as fuel.

Services

This company will furnish complete plans for municipal or industrial refuse reclamation and disposal plants.

Experts furnished for making municipal surveys covering garbage and refuse disposal.

Plans and special parts furnished for export.

Some of Our Installations

Harvard Medical College, Boston, Mass.
U. S. Naval Hospital, Portsmouth, Me.
Army & Navy Posts in United States and Panama.

City of Mansfield, Ohio.

City of Tegucigalpa, Honduras.

Tuberculosis Hospital, Pittsburgh, Pa.

Rockefeller Institute, New York, N. Y.

City of Berlin, N. H.

City of Dover, N. H.

City of Keene, N. H.

City of Springfield, Mass., 2 plants.

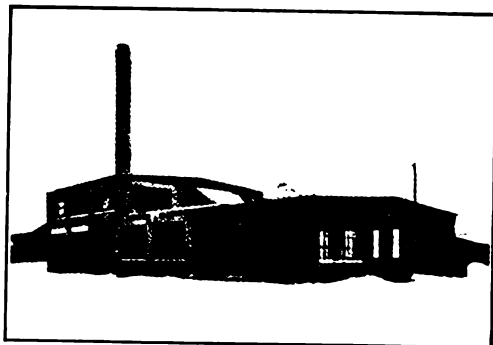
City of Cambridge, Mass.

John P. Squire Co., Boston, Mass.

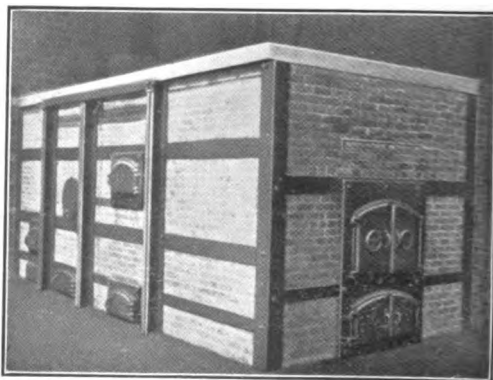
Forbes Lithograph Co., Chelsea, Mass.

Town of Sanford, Me., 2 plants.

Commonwealth of Massachusetts, 2 plants.



Municipal Disposal Station



Hospital and Industrial Destructor

STEERE ENGINEERING CO.
DETROIT, MICH.



503

GAS ENGINEERS AND BUILDERS

of

Clean Producer Gas Plants

Public Utility Gas Plants

Direct Condensing and Deammoniating Plants

Steere Electrical Detarring Process

Concrete Purifiers

Gas Valves

Governors, Controls, Regulators

Welded Steel Pipe and Fittings

Tar Extractors, Bubble Washers

Condensers, Scrubbers and Grids

Reflectors, Sockets, Panel Boards, Signals, Etc.

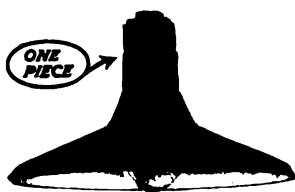
BENJAMIN ELECTRIC MFG. CO.

NEW YORK
243-247 W. 17th Street

CHICAGO
120 S. Sangamon Street

SAN FRANCISCO
590 Howard Street

BENJAMIN
PRODUCTS



Reflector Socket



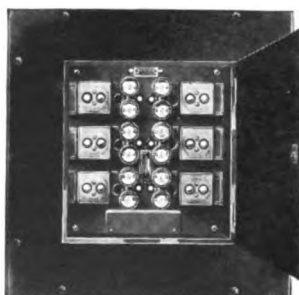
Elliptical Angle Reflector



Shade Holder Reflector



**Gas- and Vapor-Proof
Fixture**



**Dead Front Panel Board
Mounted in Cabinet**



**Water-Tight Marine
Fixture**



**"Benco" Weather-
Proof Socket**



Industrial Signal



**Water-Tight Bell with Water-
Tight High Voltage Push Button**

Complete information on any or all of the above furnished on request.

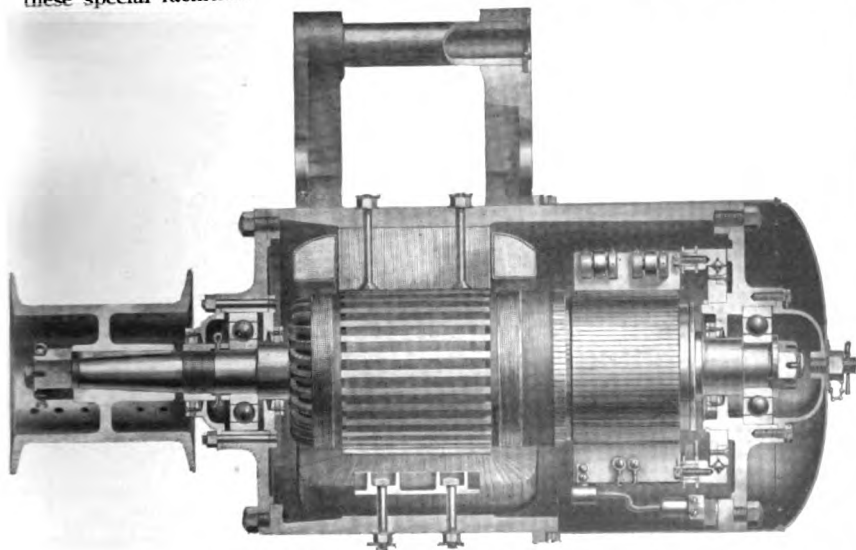
THE SAFETY CAR HEATING AND LIGHTING CO.

2 RECTOR ST., NEW YORK

CHICAGO, PHILADELPHIA, BOSTON, ST. LOUIS, SAN FRANCISCO, MONTREAL

Manufacturers of Car Lighting Apparatus—Generators, Marine Lighting Apparatus—Buoys, Beacons, Range Lights, Lanterns, Etc., Oxygen and Oxygen Cutting Apparatus. Motor Generator Sets. Brass and Bronze Castings—Fittings and Fixtures—Ventilating Fans

The Safety Car Heating and Lighting Company will be pleased to consider the manufacture of such equipment as its facilities and expert knowledge make it especially fitted for, and invites the members of the A. S. M. E. to investigate these special facilities.



Under-Frame Car Lighting Electric Generator

Lighting apparatus for railway cars, wherein careful consideration must be given to the exacting requirements of service, and lighting apparatus used to aid navigation where thorough knowledge of unusual conditions is required to successful design and manufacture, are standard lines in our manufacturing field. The manufacture of oxygen and apparatus for the utilization of oxygen is also a field wherein we have accumulated a wide experience. From these fields we have gathered a store of experience to assist in the development and manufacture of equipment such as would be used to meet special requirements in other fields.

We also manufacture a large line of lighting fixtures, buoy lanterns, etc., for service on railway cars, street railway cars, subway stations, lightships, beacons, etc. Our facilities for manufacturing brass, bronze or aluminum parts to meet special service conditions are complete.

THE EDWARDS MANUFACTURING CO.

Incorporated 1901

306-336 EGGLESTON AVE., CINCINNATI, OHIO

Consulting Engineer & Patentee, LESTER G. WILSON, Mem. A. S. M. E.

Manufacturers of Sheet Metal Building Material

BRANCH OFFICES AND WAREHOUSES

NEW YORK, N. Y., 81-83 Fulton Street
PHILADELPHIA, PA., 1414 Land Title Bldg.
BALTIMORE, MD., 7 Clay Street

PITTSBURGH, PA., Oliver Bldg.
BOSTON, MASS., 8 Beacon St.
DALLAS, TEXAS, 1635-37-39 Pacific Ave.

EDWARDS ROLLING STEEL DOORS AND SHUTTERS

Rolling Steel Doors have been designed by this Company's engineer, and successfully constructed for doorways of all sizes up to 40 feet in width, and for openings over 100 feet in height.

Rolling Shutters have been designed for windows and skylights. This Company is prepared to manufacture the combination complete, and with wire glass if desired. The rolling shutters are often operated in groups and sometimes by electric motors.

Types: Edwards Interlocking Slat Style is constructed of special cold rolled strip steel 22 to 14 gauge. *Bright or Galvanized.* Spring balanced. Handle or chain operation.

This section of slat gives great resistance to wind pressure. It was purchased by the U. S. Government for many buildings in the Panama Canal.

Edwards Corrugated Style is constructed of the best sheet steel procurable for this purpose. *Black or Galvanized.* Spring balanced. Handle or chain operation.

Our sheets have a special shape of corrugation and are fastened together without rivets.



Section of Interlocking Slat



Section of Corrugated Sheet

Special Drawings: This organization will gladly prepare details and specifications for *all* types of doors and shutters, and so assist owner, architect or engineer to select the best and most economical installation.

Uses: Specify Edwards Rolling Doors and Shutters for:

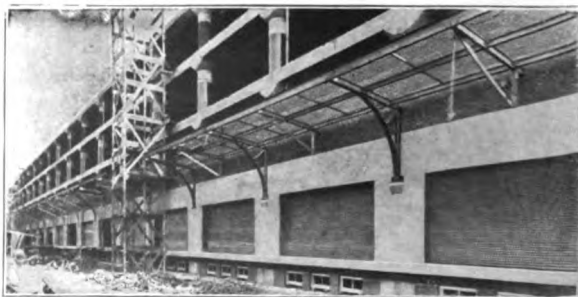
R. R. Shops
R. R. Roundhouses
R. R. Freight Sheds
Express Buildings
Steamship Docks
Grain Elevators
Telephones Exchanges
Banks
Libraries
Armories
Gun Sheds
Post Offices
Garages
Car Houses
Warehouses
Factories
Elevators
Craneways

Power Plants
Boiler Fronts
Transformers
Subways
Store Fronts
Stairways, etc.

Residences during closed seasons
Federal, County and Municipal Buildings
Office Buildings, Rear and Court Windows
Dampers for Heating and Ventilating Systems
Rolling Partitions for Churches and Schools
Cotton Mills, Compresses and Warehouse

The benefit of forty-four years' experience is placed by our Engineering Department at your disposal.

Ask for catalogs and drawings.



72 Interlocking Slat Steel Doors Installed in Pennsylvania Railroad Freight Station, Philadelphia

THE HASTINGS PAVEMENT CO.

EXECUTIVE OFFICES: 25 BROAD STREET, NEW YORK

PLANT: HASTINGS-ON-HUDSON, N. Y.

Manufacturers of Compressed Asphalt Paving Blocks and Tiles

ASPHALT PAVING BLOCKS

The logical material for the wearing surface of streets and roads, and of piers, warehouses, loading platforms, bridges, factory floors, driveways, courtyards, etc. Manufactured at a permanent plant; shipped in block form ready to lay; and always obtainable in any quantity for extension or repairs.

Composition and Size.—A properly proportioned mixture of natural asphalt crushed trap rock and limestone dust is heated to 300 degrees Fahr., and shaped into uniform blocks under a pressure of 6000 pounds per square inch. The blocks are 5 inches wide, 12 inches long, and 2, 2½ and 3 inches deep. Specific gravity, 2.40.

Advantages.—Asphalt block pavements are pleasing in appearance, smooth, noiseless, dustless, sanitary because non-absorbent, and next to granite the most durable. Present a gritty, non-slippery, non-skidable surface. Easily taken up and relaid. Reasonable cost. Not affected by extremes of temperatures. Made to suit any climate and traffic conditions.

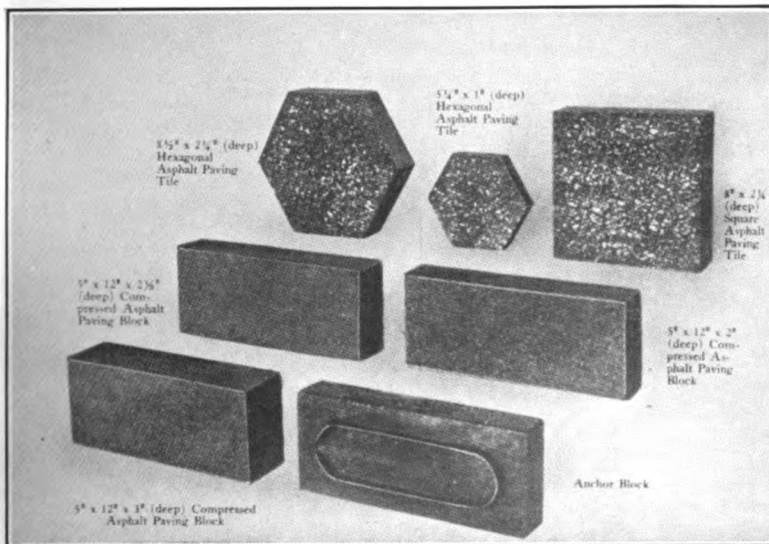
ASPHALT TILES

A wearing surface especially designed for sidewalks, and other surfaces subject to foot traffic. In the tiles, a selected white limestone is used for the mineral aggregate, instead of crushed trap rock, as used in the blocks.

"EIGHTFOUR" ASPHALT FLOORING BLOCK

The "Eightfour" is designed especially to meet those conditions in which weight and depth of flooring are important considerations. Size 8" x 4" x 1¼". Weight 15½ pounds per square foot.

507



ASPHALT BLOCK FLOORS—THE MODERN FLOOR FOR HEAVY SERVICE

**CATALOGUE SECTION
PART VI**

**Testing, Measuring and
Recording Apparatus**

509

Pages 511-540

TINIUS OLSEN TESTING MACHINE CO.

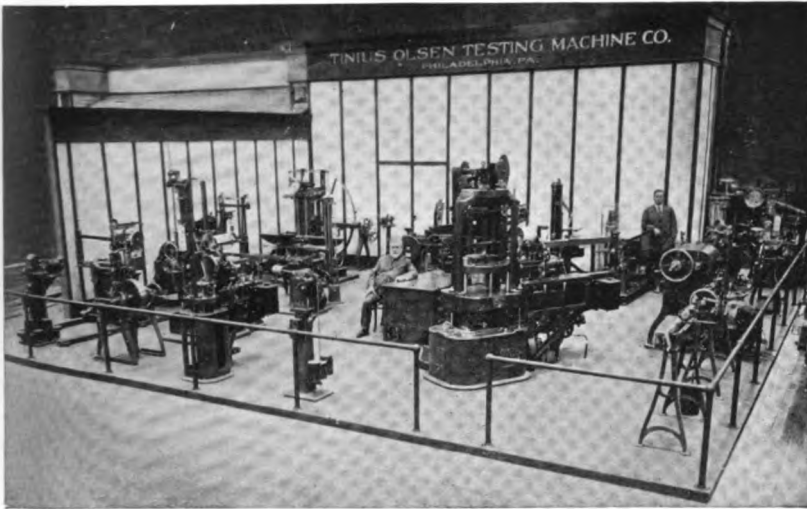
500 NORTH 12TH ST., PHILADELPHIA, PA.

Manufacturers of Testing Machinery and Instruments

OLSEN TESTING MACHINES

The following illustration is our exhibit of testing machinery at the Panama-Pacific International Exposition in San Francisco which covers the most complete up-to-date testing laboratory ever demonstrated.

This exhibit was awarded GRAND PRIX, the highest and only award of this kind ever made to a testing machine manufacturer.



511

In this exhibit are thirty different types of testing machines with the addition of a complete set of accessories and instruments. The exhibit is illustrated and described by our souvenir exposition pamphlet entitled "Olsen Testing Machines," which will be mailed on request.

We are the largest manufacturers of high grade testing machines in the world.

Builders of the largest testing machine in the world of 10,000,000 lbs. capacity used by the U. S. Bureau of Standards, at Arsenal Grounds, Pittsburgh, Penna.

Our Catalog covers all the latest up-to-date testing machines and is divided into eight parts as follows:

Part A—Universal Testing Machines and Instruments.

Part B—Spring Testing Apparatus and Machinery.

Part C—Cement, Concrete and Road Materials Testing Machinery.

Part D—Cloth, Yarn, Paper, Rubber and Leather Testing Machinery.

Part E—Wire, Chain and Anchor Testing Machinery.

Part F—Oil Testing Machinery and Dynamometers.

Part G—Transverse and Beam Testing Machines. Foundry Testing Machines.

Part H—Special Testing Machinery, Including Impact, Indentation, Vibratory, Bending, Hardness, Endurance, Torsion, Fatigue and Efficiency Testing Machines.

Any parts will be mailed on request.

Testing machines designed and built to meet any special requirements.

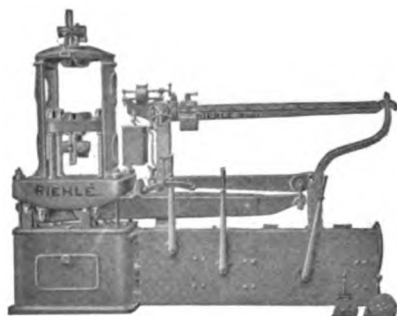
Our experts will be glad to recommend and lay out complete testing laboratories when desired.

RIEHLÉ BROS. TESTING MACHINE CO.

1424 NORTH 9TH STREET, PHILADELPHIA, PA.

Manufacturers of Testing Machines and Testing Appliances

RIEHLÉ TESTING MACHINES are used by the leading Colleges, Steel and Iron Works, United States Government, many foreign Governments, and are recommended by many of the most prominent and successful Engineers throughout the world. We design and build these machines from 5000 lbs. to 2,000,000 lbs. and over in capacity for the determination of any physical property.



Riehlé U. S. Standard Vertical Screw-Power Testing Machine. Three-Screw Type, 100,000 Lbs. Capacity

Features of Riehlé Testing Machines

Designed Right.
Plenty Strong Enough.
No Sparing of Material.
Long Base Lines.
Simple in Construction.
All Parts Accessible, without taking whole machine apart.
Fine Finish. Attractive in Appearance.

NOTE

We are now building all the Riehlé Vertical Screw Power-Testing Machines with two (2), three (3), or four (4) Main Pulling Screws as may be desired.

512

For quick and convenient reference our complete line of Testing Machines is catalogued as enumerated below:

RIEHLÉ TESTING MACHINE CATALOGUE "A"

Illustrating and describing all the large Riehlé U. S. Standard Testing Machines, Screw and Hydraulic Power, also new and ingenious tools for same; Machines for Long Transverse Members, Torsional and Impact Testing, also Calibrating Levers.

RIEHLÉ CATALOGUE "AA" OF EXTENSOMETERS, COMPRESSOMETERS, AND TORSION METERS

Containing illustrations and descriptions of the very latest and best Riehlé Extensometers.

RIEHLÉ TESTING MACHINE CATALOGUE "B"

Embracing all the various styles of Riehlé U. S. Standard Testers for Wire, Cloth, Canvas, Cord, Twine and Textile Fabrics of all kinds, also for every variety of test.

This catalogue is well worth your careful perusal.

RIEHLÉ CHAIN TESTING MACHINE CATALOGUE "C"

In this Catalogue is found all that is *newest and best* in Testing Machinery for Chain, Wire, Hemp, Rope, Eye-Bars, Bridge Irons, etc. Special Machines for different forms of materials can be designed along these lines. We also furnish Hydraulic Pumps separately if desired. We claim these Machines are the Strongest and Best in the World.

RIEHLÉ TESTING MACHINE CATALOGUE "D"

Containing illustrations of Transverse Bending, and Special Testing Machines, Rope Twisters, Loam Mills, Pipe Provers, etc. Every Foundry and Machine Shop should install some of the articles shown in this Catalogue.

RIEHLÉ TESTING MACHINE CATALOGUE "E"

Those interested in Machines for testing Springs of all kinds, also Oils and Bearing Metals, are specially referred to this Catalogue for all the newest and best Machines.

RIEHLÉ CATALOGUE "F"

In this Catalogue are presented illustrations and descriptions of superior designs and patterns of Hand and Power Hydraulic Pumps and Presses, also Riehlé-Robie Patented Screw Jacks, etc.

RIEHLÉ CEMENT-TESTING MACHINE CATALOGUE "G"

In this Catalogue one will find "everything that is good" in the way of testing Cements, Asphalts, Building Material, and also every conceivable article for thoroughly equipping a Physical Testing Laboratory for that kind of work. Be sure and send for this Catalogue.

RIEHLÉ ROAD MATERIALS TESTING MACHINE CATALOGUE "K"

In this Catalogue you will find illustrations of everything to make tests of Road Materials, as used by the United States Government, Department of Public Roads, Washington, D. C.

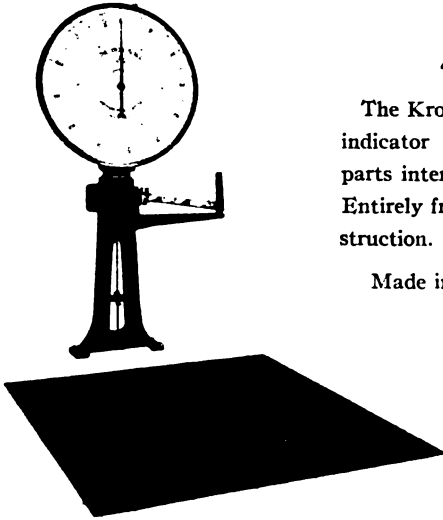
Select the Catalogues you want when ready to order.

We are the oldest and largest Testing Machine manufacturers in the United States. Established nearly 50 years ago.

AMERICAN KRON SCALE CO.

430 E. 53RD ST., NEW YORK

Manufacturers of the Kron Automatic Springless Dial Scale



THE KRON SCALE

Automatic—Springless

"LOAD AND LOOK"

The Kron Scale is an automatic weighing indicator for light and heavy work. All parts interchangeable regardless of capacity. Entirely free from springs. All metal construction. *It seals itself.*

Made in U. S. A.

Advantages of the Kron Scale

Where rapid and accurate weighing is desired the Kron scale should be installed.

513

The Kron is Automatic. It is the only scale that will indicate the total load on the dial without any manipulation of extra weights or sliding poises.

The Kron is Non-Vibrating—the pointer always stops "dead" at accurate weight.

The Kron is Highly Sensitive—but it is not delicate and parts can be replaced within a very few minutes.

The Kron is Strongly Built upon a Proven Principle—hence its maintenance cost is practically nil.

Types of the Kron Scale

Made in all types and capacities from a 30" Hanging Pan Scale to Industrial Railway Scale up to 15 tons.

The Dormant type shown above is equipped with tare beam and locking lever. Suspension type platform with Kron diamond checkered steel top. Capacity 500 lbs. to 10,000 lbs. Platform Dimensions 33" x 33" to 96" x 54".

Portable types made with platform size 24" x 24" and upward. Capacities, 200 lbs. and upward.

Travelling Crane Scales; Hopper Scales; Dormant Pitless Suspension Scales and Special Scales.

RICHARDSON SCALE COMPANY

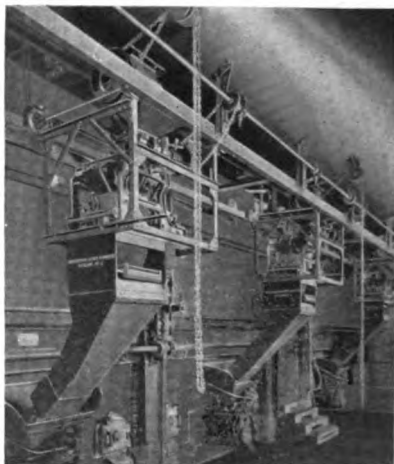
PASSAIC, N. J.

Branches in all large cities

AUTOMATIC SCALES

For weighing all kinds of crushed, granular, lumpy and powdered materials. We also manufacture scales for weighing liquids. The following treats specifically of the Richardson Automatic Coal Scales.

Like all Richardson Automatics, the Coal Scale is built on the weight for weight principle. Suspended on the opposite ends of a beam, balanced in the centre, are a hopper and weight box that exactly balance each other when empty. When the weight of material in the hopper equals the weights in the weight box, the beam comes to a balance, simultaneously cutting off the stream from above and opening the hopper door, causing it to discharge. Thus the Richardson Automatic weighs the coal as it is fed to the fire. A mechanical counter records the weight.



Three Richardson Automatic 100-lb. Boiler Scales Installed at the Plant of Philadelphia & West Chester Traction Co., Llanerch, Pa.

The Fuel Administration since its organization has never ceased to urge upon Power Plant Owners the advisability of a daily comparison of the weights of coal burned with water evaporated. Recently it has announced that plants that fail to comply with this and other requirements looking to fuel economy will be the last served.

Used in conjunction with suitable means of weighing the water evaporated Richardson Automatic Coal Scales make possible the continuous evaporation tests recommended by the Fuel Administration.

Another service performed by the Richardson Automatic is more commonplace but equally important from a commercial viewpoint, *viz.*, to check the weight of coal received against the weight billed. Aside from deliberate dishonesty on part of the vendor, there is much pilfering from coal cars and wagons en route and this precaution is well worth taking.

Bulletin 101 describes all types of this scale in detail and also cites examples of results obtained by its use.

JOHN SIMMONS CO.

110 CENTER ST., NEW YORK, U. S. A.

Steam and Mechanical Specialties

LEINERT AUTOMATIC GRAVITY SCALES

For Measuring by Actual Weight

WATER—OIL—SUGAR—JUICE—
SPIRITS—PETROLEUM—AMMONIA—
BRINE—CHEMICALS AND LIQUIDS
OF ALL DESCRIPTIONS.

Simple: Accurate: Reliable

NOT AFFECTED BY TEMPERATURE
PRACTICALLY NO WEARING PARTS

The Pre-eminent Meter
for
Power House Service



Types: At the present time these machines are made in ten standard sizes with charge capacities (i. e., contents of single bucket) from 10 lbs. in the smallest No. 1 machine, up to 2,000 lbs. The normal capacities per hour in the table are based on a conservative speed of one discharge (one tilt of the bucket) per minute.

The Type "A" machines have for inlet mechanism a three-way cylindrical valve and are suitable for all liquids with the exception of very sticky ones for which Type "C" machines having as inlet an oscillating trough, called deflector, should be preferred.

For measuring hot water or liquids emanating obnoxious gases the machines must be enclosed in a casing Type "AE" and Type "CE" machines.

The Type "B" machines in which the measuring buckets tilt under a reduced feeding stream make it possible to obtain, in a simple way, the highest degree of accuracy in the automatic weighing of liquids.

Durability: All parts being easily accessible can be cleaned whenever necessary even during operation. The measuring tanks and other parts in contact with liquid can be made of the best resisting material and are not otherwise subjected to serious wear.

Accuracy: These machines being a modified form of a one-lever balance with a single pair of knife edges, when once in operation, being free from human errors, obviously give in industrial practice an accuracy far superior to that obtained by hand weighing on commercial scales. Type "A" and Type "C" machines have an accuracy of less than one-half of 1 per cent., while Type "B" machines possess a correspondingly higher accuracy.

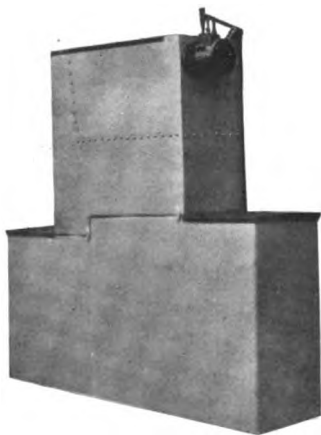
LEINERT AUTOMATIC LIQUID SCALES TYPE "A"

SIZE NO.	APPROXIMATE NORM. CAPACITIES: Water, Petroleum, Milk, Etc.		LBS. PER DIS-CHARGE	SIZE OF INLET PIPE	APPROXIMATE DIMENSIONS			
	U S Gals. Per Min	Lbs. Per Hour			Length	Width	Height	Base to End Siphon
1	1.1	800	10	1/2"	1'-0"	1'-6"	1'-1"	0'-8"
3	7 1/2	3600	60	1"	2'-5 1/2"	2'-5"	1'-9 1/4"	0'-9"
4	12	6000	100	1 1/2"	2'-10"	2'-9"	2'-3 1/4"	0'-9 1/2"
5	30	15000	250	2"	3'-9"	3'-8 1/2"	2'-10 1/2"	1'-3 1/2"
6	60	30000	500	2 1/2"	4'-7"	4'-6"	3'-5"	1'-5"
8	120	60000	1000	3"	6'-0"	5'-8"	4'-0"	1'-8"
9	180	90000	1500	3 1/2"	7'-0"	6'-7"	4'-7"	1'-9"
10	240	120000	2000	4 1/2"	7'-9"	7'-4"	5'-2"	2'-4"

WILLCOX ENGINEERING CO.

SAGINAW, MICHIGAN, U. S. A.

Manufacturers of Water Weighers



Willcox Rectangular Water Weigher with Storage Tank, Style C, Front View

THE WILLCOX WATER WEIGHER

is a device for automatically weighing and recording the water fed to boilers. It takes water from any source, such as a feed-water heater, tank, pump or hydrant, at any rate of flow or at varying rates, and delivers it intermittently in charges of uniform weight.

It will weigh hot feed water from an open heater, cold water from a hydrant, water of condensation from vacuum pans or heating systems, also chemicals, caustic solutions, volatile oils, sugar juices, etc.

Operation: The charge is weighed by a liquid column of fixed height, through the medium of an air balance. The unit charge is dumped automatically by the sudden release of the entrapped air—an extremely accurate and reliable method of balancing.

Accuracy: Each weigher is guaranteed to weigh within one per cent of perfect accuracy at any rate of supply up to its maximum capacity.

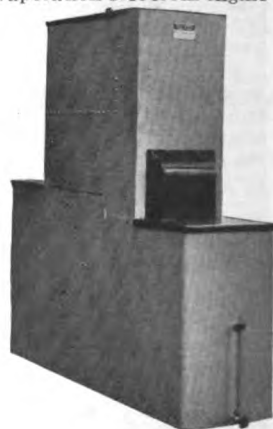
Styles and Capacities: The Willcox Water Weigher is built in several styles to suit various requirements: portable weigher for evaporative and condensing tests, and power-plant sets for permanent installation. All capacities from one thousand pounds per hour up to half a million pounds.

Plans for Installation: Suggestions, sketches and plans for proposed installation are furnished free of charge by the Willcox Engineering Company. We have competent engineers and draftsmen for the purpose of assisting prospective customers in planning suitable arrangements to meet local conditions.

Savings Secured in Boiler Plants: This simple, reliable, automatic self-recording device for continuously and accurately recording every pound of water pumped to the boilers, provides a means of segregating boiler evaporation cost from engine and generator performance, thereby determining from day to day whether or not proper evaporation is being secured per pound of coal.

GENERAL DIMENSIONS—STYLE C RECTANGULAR, BUILT OF BOILER PLATE

Size No.	Maximum rate of weighing, in lbs. of water per hour	Size inlet, in.	Shell thickness	APPROXIMATE	
				Ship's weight	Weight of water per unit charge
5	200,000	6	$\frac{1}{4}$	2100	2700
7	150,000	6	$\frac{1}{4}$	1850	2250
9	100,000	6	$\frac{1}{8}$	1500	1800
11	75,000	4	$\frac{1}{8}$	1200	1500
12	62,500	4	$\frac{1}{8}$	1100	1180
14	40,000	3	$\frac{1}{4}$	600	680
16	25,000	2 $\frac{1}{2}$	$\frac{1}{4}$	400	420
18	15,000	2	$\frac{1}{4}$	275	200
20	10,000	2	$\frac{1}{4}$	175	120
22	5,000	1 $\frac{1}{2}$	$\frac{1}{4}$	150	60



The Willcox Automatic Water Weigher with Storage Tank, Style C, Rear View

Send for Water Weigher Catalogue W 9

NATIONAL METER COMPANY

Established 1870

299 BROADWAY,

NEW YORK CITY

Manufacturers of Water Meters and Gas Engines

BRANCH OFFICES:

CHICAGO, 1227 Wabash Ave. BOSTON, 159 Franklin St. CINCINNATI, 224 East 4th St.
PITTSBURGH, 4 Smithfield St. ATLANTA, 3d Nat. Bank Bldg. LOS ANGELES, 411 S. Main St.
SAN FRANCISCO, 141 New Montgomery St. WINNIPEG, MANITOBA, 229 Spence St.
LONDON, Caxton House

THE CROWN METER is a positive displacement water meter of the rotary piston type. This meter has been made and sold by us for nearly forty years. It is substantial, durable and accurate. We make this meter in sizes from $\frac{3}{8}$ " to 6".

THE EMPIRE METER is a positive displacement water meter of the oscillating piston type. It is the most accurate, durable and generally satisfactory meter manufactured today. Owing to the simple construction of its measuring chamber the accuracy of this meter can be maintained indefinitely at a minimum cost. This meter is one of the best devices now manufactured for measuring oil. It is made in sizes from $\frac{3}{8}$ " to 6".

THE NASH METER is a positive displacement water meter of the disc type. This meter has been on the market for over twenty-five years. The reinforced disc, frost-proof feature and straight reading register are a few of its many superior advantages. The meter is made in sizes from $\frac{3}{8}$ " to 6".

THE GEM METER is a water meter of the velocity or current type and has been made by us since 1870. It is intended for service when a large and rapid delivery of water is of special advantage. It is made in sizes from 2" to 12".

THE PREMIER METER is a water meter constructed of a Venturi Tube and a by-pass on which an accurate, positive displacement meter is installed. This meter is intended to measure the complete supply of a city or other large service. The Premier is made in sizes from 8" to 48".

THE EMPIRE COMPOUND METER is a water meter constructed by combining our Empire and Gem meters. It will measure with great accuracy large and small flows, and will operate most satisfactorily under greatly varying conditions. The Empire section is always open. The Gem section is controlled by a check valve which opens automatically when called upon to measure a stream larger than the capacity of the Empire. This meter is made in sizes from 2" to 12".

Our meters form a standard by which all others are judged.

No matter what your conditions may be, we can offer you the

BEST METER FOR YOUR SERVICE.

NEPTUNE METER COMPANY

50 EAST 42ND STREET, NEW YORK CITY

Trident Water Meters—The Weber Subterranean Pump

BRANCH OFFICES

ATLANTA
BOSTON
CHICAGO
CINCINNATI
DENVER

LOS ANGELES
PORTLAND
SALT LAKE CITY
SAN FRANCISCO
SEATTLE

SPOKANE
VANCOUVER, B. C.
LONDON, ENGLAND
PARIS, FRANCE
KOBE, JAPAN

Trident-
Protectus

Trident-
Crest

Trident-
Style 3
3"-4"-6"

Trident-
Vertical
Crest

Trident-
Water
Cart

Trident-
Break-
able
Bottom

Trident-
Victor



Trident-
Com-
pound

Trident-
Style 3
1½"-2"

Trident-
Portable
Test

Trident-
Split
Case

A TRIDENT FOR EVERY SERVICE

More than a million and a half Tridents in service give us pre-eminence among water-meter manufacturers, and speak for the *worth* of Trident Meters.

Our new catalogue, entitled "Twenty-Five Years of Success," will be promptly sent upon request.

BAILEY METER COMPANY

141 MILK ST., BOSTON, MASS.

Manufacturers of Recording Meters and Testing Instruments

BAILEY FLUID METERS

Are the most practical and accurate meters for recording and integrating the flow of steam to turbines, engines, heating systems, general mill use; low pressure steam, exhaust, and in fact for all purposes. Equally well adapted to measure the flow of water, air, gases and other fluids, under practically all conditions of pressure, temperature and capacity.

There are but two moving parts to this meter and they are not subjected to the direct action of the steam, hot gases or other fluid being metered. The meter is operated by a pressure difference which is produced by the fluid flowing through an orifice placed between a pair of flanges in the pipe line.

Bailey Fluid Meter Type C2 Recording and Integrating Flow, also Recording Pressure and Temperature illustrated above.



BAILEY BOILER METER

This meter records Steam Flow, Air Flow and Flue Gas Temperature all on the same chart. It may also be provided with fire box draft indicator, wind box pressure recorder or other supplementary records. It also may be provided with integrator giving the total evaporation from the boiler in thousand pounds of steam, from which the actual evaporation of useful steam delivered to the header per pound of coal is determined.

The most important feature of this meter lies in the ratio between the Air Flow and Steam Flow. Air is a fuel just as much as coal, and a certain evaporation per pound of air should be obtained. When this condition exists the two pens and records show the same reading. When there is an excess of air, the Air Flow reading is greater than the Steam Flow. A deficiency of air resulting in loss due to unburned gases is shown by the Air Flow reading being less than the Steam Flow.

Flue gas temperature recorded on the same chart is a positive check against dirty tubes and leaky baffles.

BAILEY WEIR METER: Recording and integrating flow of water or other liquids through V-Notch or rectangular weirs. For feed water, hot well discharge, etc., at or near atmospheric pressure.

BAILEY GAS FLOW METER: Recording rate of flow of air or gas at low velocities and at or near atmospheric pressure. For measuring flue gas, mine ventilation, fan discharge, etc.

BAILEY DIFFERENTIAL PRESSURE RECORDER: Measuring pressure, suction or differential pressure of any gas or air. Extremely sensitive. Accurate to $1/1000$ " water. For draft in furnaces, flues, gas works, ventilating systems, mine ventilation, etc.

"THE CO₂ METHOD OF STEAM MEASUREMENT." Measuring steam flow with great accuracy regardless of pressure, temperature or density. For meter calibration and test work without any change in piping, weighing of water, or utilizing any pressure or temperature readings. Also adapted to water, air and gases.

Bulletin No. 5 contains the complete line of Bailey recording meters and testing instruments. Sent free on request.



BUILDERS IRON FOUNDRY

PROVIDENCE, R. I.

Venturi Meters for Cold Water, Hot Water, Brine, Chemical Solutions, Sewage, Steam, Gas and Air; Globe Special Castings for Water Works; Grinding Machinery; Polishing Machinery

THE VENTURI METER

The Venturi Meter consists of a Venturi Meter Tube and a Register or Recording Instrument. The Meter Tube is set in the pipe line similar to a section of pipe, and the instrument, which is connected to the Meter Tube by two small pipes, can be set in any convenient space where the readings may be easily observed. An historical sketch of the Venturi Meter is given in Bulletin No. 20.

THE VENTURI COLD WATER METER

This is a type which may be used in connection with Gravity Mains, Pump Discharge Lines, Filtration Plants, Sewage Disposal Systems, Hydraulic Turbines, Refrigerating Plants, etc. Our Bulletin No. 75 contains descriptions, illustrations, tables of capacities and other data.

STANDARD VENTURI METER TUBES AND CORRESPONDING MEASURING CAPACITIES

Inches Diam- eter of Pipe	Catalog Number	Length of Meter Tube	Pounds per Hour Maxi- mum	Gallons per Minute Maxi- mum	Gallons per 24 Hours Maxi- mum
2	2 $\frac{3}{4}$	1'-11 $\frac{3}{4}$ "	17600	35	51000
	2 $\frac{3}{4}$	1'-10 $\frac{1}{4}$ "	25400	55	73000
	21	1'-7"	45100	90	130000
3	31	2'-11"	45100	90	130000
	31 $\frac{1}{4}$	2'-7 $\frac{3}{4}$ "	70400	140	203000
	31 $\frac{1}{2}$	2'-4 $\frac{1}{2}$ "	102000	205	293000
4	41 $\frac{1}{4}$	4'-3 $\frac{3}{4}$ "	70400	140	203000
	41 $\frac{1}{8}$	3'-10 $\frac{3}{8}$ "	119000	240	343000
	42	3'-6"	181000	360	520000
5	51 $\frac{1}{8}$	5'-1 $\frac{3}{8}$ "	119000	240	343000
	52	4'-8 $\frac{1}{2}$ "	181000	360	520000
	52 $\frac{1}{2}$	4'-2"	282000	565	813000
6	62	5'-11"	181000	360	520000
	62 $\frac{1}{2}$	5'-4 $\frac{1}{2}$ "	282000	565	813000
	63	4'-10"	406000	810	1170000
12	124	11'-0"	722000	1440	2080000
	125	9'-11"	1129000	2260	3250000
	126	8'-10"	1626000	3250	4680000
24	248	21'-2"	...	5780	8320000
	2410	19'-0"	...	9020	13000000
	2412	16'-10"	...	13000	18720000
36	3612	31'-4"	...	13000	18720000
	3615	28'-1"	...	20300	29250000
	3618	24'-10"	...	29300	42120000
48	4816	41'-6"	...	23100	33280000
	4820	37'-2"	...	36100	52000000
	4824	32'-10"	...	52000	74880000

Type W Instrument

Dimensions of other sizes on application.

THE VENTURI HOT WATER METER



This meter, the tube of which is illustrated, is admirably adapted to the measurement of hot boiler feed water, hot water from condensers, hot circulating water for heating systems, etc. The entire absence of mechanism or projections within the Venturi Tube gives the Venturi great advantages over various types of mechanical or flow meters, and its initial accuracy, which is guaranteed, remains unchanged in actual service. It is fully described in Bulletin No. 68.

THE VENTURI AIR, STEAM AND GAS METER

For the measurement of Air, Gas and Steam the Venturi offers distinct advantages, among which are Simplicity, Compactness, Adaptability to Changes in Measuring Capacity, and Low Cost. Bulletin No. 76 describes the Meter for Air and Gas and Bulletin No. 79 for Steam.

Any or all of the above Bulletins will be mailed on request.

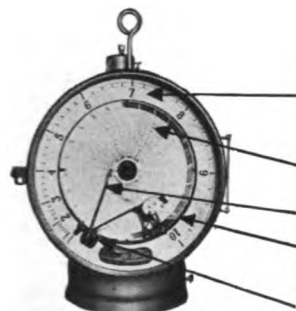
GENERAL ELECTRIC COMPANY

GENERAL OFFICE: SCHENECTADY, N. Y.

Sales Offices in All Large Cities

G-E FLOW METERS

For Measuring
STEAM AND WATER



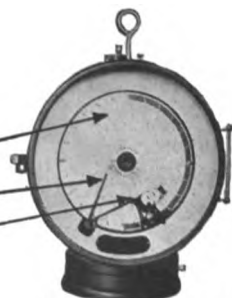
{ Indicating Scale from which the Instantaneous Rate of Flow is Read. }

{ Chart on which the Flow is Recorded. }

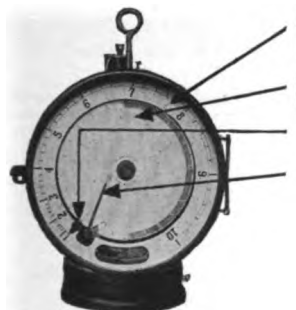
Curve Drawing Pen.
{ Integrating Dials from which the Total Flow is Read. }

Indicating Pointer.

Indicating, Recording, Integrating
Type FS-4 Steam
Type FW-4 Water



Recording, Integrating
Type F
Steam or Water



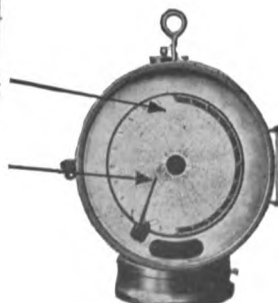
{ Indicating 'Scale' from which the Instantaneous Rate of Flow is Read. }

{ Chart on which the Flow is Recorded. }

Indicating Pointer.

Curve Drawing Pen.

Indicating, Recording
Type FS-4 Steam
Type FW-4 Water



Recording
Type F
Steam or Water

{ Diameter of Scale is }
17 Inches.

{ Indicating }
Pointer.



{ Height of Figures on }
the Scale is $\frac{7}{8}$ in. }

{ Indicating Scale from }
which the Instantaneous }
Rate of Flow is Read. }

Indicating
Type FS-5 Steam
Type FW-5 Water



REPUBLIC FLOW METERS CO.

565 W. WASHINGTON BLVD., CHICAGO

Manufacturers of Meters for Steam, Water, Air or Gas; also Hydrometers

THE REPUBLIC FLOW METER accurately measures the fluid passing through a pipe to which the instrument is attached.

The illustration shows a complete installation. It comprises a regular transformer producing an individual low voltage circuit which includes the instruments on the panel, the meter body, and is completed through the ground.

A Pitot tube, inserted into the pipe where the flow is to be measured, transmits the pressure difference created by the flow to a mercury column in the meter body. The rise and fall of the mercury column is made to engage and disengage suitable conductors regulating the amount of current flowing through the circuit.

Accordingly, the exact electrical energy measured by the Flow Integrator is the exact equivalent to the total amount of fluid passing through the pipe, and the instantaneous flow of current shown by the Indicator and Recorder is equivalent to the instantaneous flow of fluid through the pipe.

PRINCIPAL ADVANTAGES:

1. The action is performed by means of an electric current, thus avoiding all uncertain mechanical movements, such as floats, cams, levers and gears. There are no moving parts in the meter body.

2. The accuracy of highly refined electrical instruments, combined with the accuracy of the Pitot tube, insures the accurate measurement of the flow.

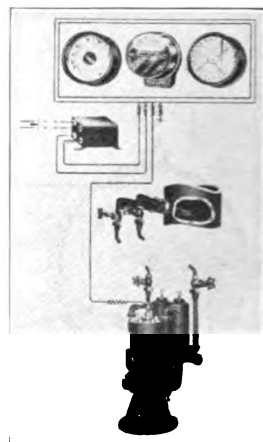
3. The instruments for indicating, integrating and recording the flow can be arranged to meet all possible conditions, because they can be either separated, or combined, or duplicated, and can be placed at any desired distance from the pipe line.

READING INSTRUMENTS:

The Indicator is made in two sizes, one ten inches in diameter, used for boiler front mounting, and one seven and one-half inches, used for panel mounting.

The Recorder is twelve inches in diameter and is equipped with a ten-inch chart graduated from 0-100.

The Integrator is provided with four dials and is equipped with a glass cover. It is simple and rugged in design and will accurately total the flow over any given period of time.



REPUBLIC RECORDING HYDROMETERS

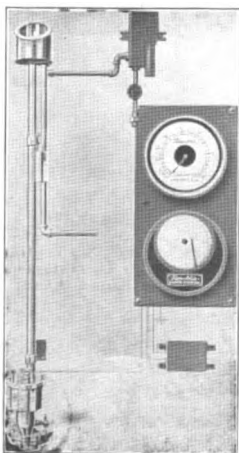
The Republic Recording Hydrometer automatically supplies a constant measurement of the density of fluids in all processes and replaces the floating glass hydrometer.

The hydrometer is placed at the point of measurement and a sample of the fluid is made to pass constantly through it. The measurement of the density of this fluid is electrically transmitted to an indicating instrument. A constant reading of the density thus is obtained.

The readings of the instruments are automatically corrected to a standard temperature by means of a temperature compensating device.

Hydrometers Calibrated for Baumé, Brix or Direct Gravity Scales.

Where the proper density of the fluid is important, the Republic Recording Hydrometer renders an invaluable service. Sugar, oil and starch refineries, distilleries, breweries, refrigerator and ice plants, chemical manufacturers, etc., find the Republic Recording Hydrometer an absolute necessity.



THE JOS. W. HAYS CORPORATION

MICHIGAN CITY, INDIANA

Manufacturers of Hays Apparatus

Draft Gages

All varieties and ranges.

Gas Analyzers

16 different models.

CO₂ and Draft Recorders

Oxygen Recorders

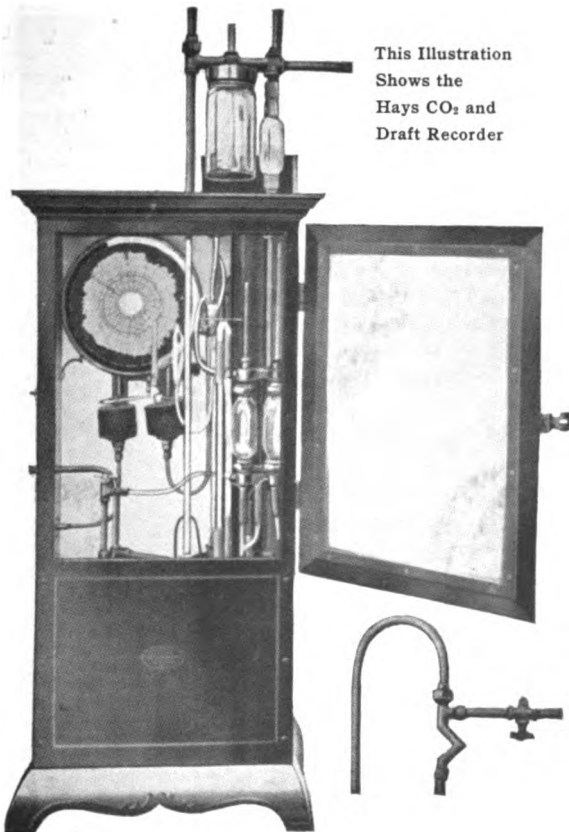
Time Firing Indicators

**Indicating and Recording Pyrometers
and Thermometers**

Recording Gages

Etc., Etc.

Write and let us know your requirements.

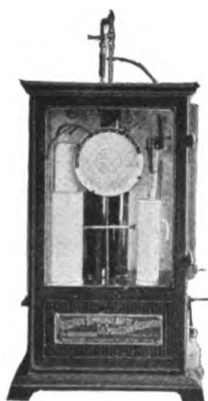


This Illustration
Shows the
Hays CO₂ and
Draft Recorder

PRECISION INSTRUMENT CO.

DETROIT, MICH.

Engineers; Manufacturers of Measuring and Regulating Instruments



CO₂ RECORDERS

For all percentages of CO₂.
Accurate to 0.5 of 1% CO₂.
24 hour and 60 day types.

OUR PRODUCTS

CO₂ RECORDERS
INDICATING GAUGES
RECORDING GAUGES
MICROMETER GAUGES
DIFFERENTIAL GAUGES
50 and 100 CC ORSATS
EFFICIENCY KITS
BOILER TESTERS
U GAUGES



"3 IN 1" GAUGE

The only combination gauge on the market. Designed for either forced draft or natural draft. Requires but little space on the Gauge Board.

SPECIAL GLASS
THERMOMETERS
GAS COLLECTORS
ARGAND BURNERS
COAL CALORIMETERS
CALORGRAPHS



SPEED INDICATOR

For Venturi or Pilot
System
Miles per hour of
Your Aeroplane

Our catalogue will
be sent you together
with "Importance of
High Percent of
CO₂" on request.



RECORDING GAUGE



"2 IN 1" GAUGE

FOR Dependability, Accuracy for all gauges
Use "Precision."



UEHLING INSTRUMENT COMPANY

2011 EMPIRE BUILDING, NEW YORK CITY

Manufacturing Engineers—Combustion Economists

UEHLING CO₂ RECORDERS

and other instruments as listed below

Uehling CO₂ Equipment provides the means for obtaining and maintaining high boiler efficiency. Such equipment consists of the **Instrument Proper**, which can be located in the engine-room or any other convenient part of the plant, the **Recording Gauge** which can be located in the office of the Chief Engineer or Superintendent, and the **Auxiliary CO₂ Indicator** which can be located at the boiler front so that the fireman can be held responsible for the fuel wasted up the chimney, just the same as he is held responsible for an even steam pressure by means of the recording steam gauge.

Record of CO₂ and Stack Temperature on One Chart

The per cent of CO₂ in the products of combustion is a true index of the excess air used, therefore the lower the per cent of CO₂ the greater the volume of products of combustion per pound of fuel consumed, and since all gases leave the boiler at stack temperature the per cent of CO₂ in the products of combustion bears a direct relation to the sensible heat wasted up the chimney.

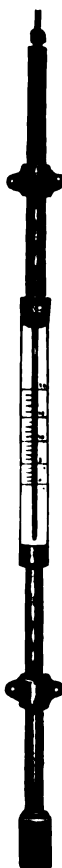
OTHER UEHLING INSTRUMENTS

- | | |
|---|---|
| Uehling Draft Recording Gauge. | Uehling Vacuum Recorder. |
| Uehling Differential Draft Recorder. | Uehling Combined Barometer and Vacuum Recorder. |
| Uehling Draft Indicator. | Uehling Absolute Pressure Indicator. |
| Uehling Differential Draft Indicator. | Uehling Pneumatic Pyrometer. |
| Uehling Draft Analyzer. | Uehling Revolution Recorder. |
| Uehling Light Pressure and Vacuum Recorder. | |

The distinctive features of Uehling Recording Instruments are *Simplicity, Accuracy and Reliability*. They are based on the *hydrostatic principle*, by the application of which all springs, levers and joint movements are avoided.

In addition to these important advantages, the hydrostatic principle permits of making the scale open, between the limits where the readings are important, and narrow, where they are unimportant, or eliminating that part of the scale altogether which is of no use, thus utilizing the whole width of the chart for important readings.

Send for Catalogs and booklet "Combustion and the Cost of Power."



CO₂ Indicator for Boiler Front

THE ASHTON VALVE COMPANY

161 FIRST ST., CAMBRIDGE, BOSTON, MASS.

BRANCH OFFICES

137 Liberty St., New York

318 W. Washington St., CHICAGO, ILL.

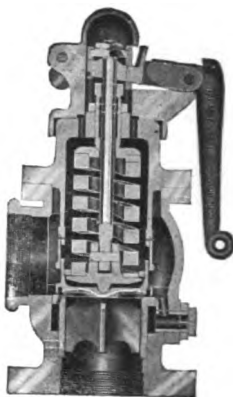
503 Mission St., SAN FRANCISCO, CAL.

Manufacturers of Pop Safety Valves, Pressure and Vacuum Gages and Kindred Engineering Specialties

THE ASHTON IMPROVED POP SAFETY VALVE

embodies the latest improvements in the state of the Art and has been the acknowledged Quality Standard among Engineers for the past 47 years. When of proper size Ashton Valves give prompt and full relief to a boiler and prevent any accumulation of pressure above the point at which they are set. They are reliable and sensitive in action, and operate with a uniform and only moderate blow back, thereby showing greatest economy in both fuel and steam. They are solid in construction with all working parts of high grade material insuring most durable service and lowest cost of maintenance.

Ashton Pop Safety Valves are made to give any desired capacity of relief, and when so specified are furnished to fully comply with the requirements of the A. S. M. E. Boiler Code, as well as any special State or local regulations.



THE ASHTON IMPROVED DEAD WEIGHT PRESSURE GAGE TESTER

offers the most modern method for obtaining an accurate test of pressure gages by means of weights. It is convenient in form and readily portable, being packed in two separate cases with locked covers and furnished with substantial handles.

The style illustrated with double area piston requires only one-fourth the usual number of weights and is suitable for high pressure testing up to a maximum of either 500 or 1000 lbs. per sq. in. It is also adaptable for low pressure testing by a simple adjustment of the two small valves on opposite sides of the vertical cylinder, which can readily be done while the machine is in use. Single Area Testers are furnished for pressures up to 300 lbs.



THE ASHTON IMPROVED PRESSURE AND VACUUM GAGES

are made for all kinds of service in either plain registering or recording styles, and of either single or double spring construction. The springs are of best quality seamless drawn tubing, the movements non-corrosive with German Silver pinions and arbors, and the dials accurately graduated.

Ashton Recording Gages as illustrated give a daily record on paper charts showing all pressure variations both day and night giving the time and length of every change, thus assuring careful firing, steady pressure, and highest efficiency and economy.

Each gage is furnished with one year's supply of charts, ink and pen filler.



Our finely illustrated and descriptive book of 120 pages tells all about the full line of Ashton Specialties. Write for it NOW

CROSBY STEAM GAGE & VALVE CO.

EXECUTIVE OFFICES

40 CENTRAL ST., BOSTON, MASS.

STORES: BOSTON, 38 Central Street NEW YORK, Hudson Terminal Bldg., Dey Street
CHICAGO, 180 No. Market Street LONDON, Eng., 147 Queen Victoria Street

Manufacturers of Standard Steam Appliances

We present for the consideration of Mechanical Engineers certain instruments of our manufacture which we believe are scientifically and mechanically the best of their kind yet produced.

GAGES

For any and all purposes.



Crosby Pressure Gage

RECORDING GAGES

Daily, weekly or continuous records for Pressure, Vacuum, Hydraulic, etc.



Crosby Pressure Gage Tester

GAGE TESTING INSTRUMENT

Made on scientific principles and is mathematically correct.

REVOLUTION COUNTERS

Positive in action, reliable, durable.



Crosby Revolution Counter

RECORDING COUNTERS

An instrument of wide application and of the greatest usefulness to engineers.

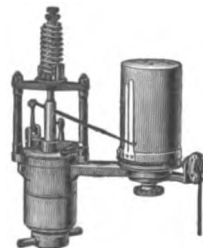
INDICATORS

Steam, Gas, Hydraulic, etc.

As perfect in workmanship and operation as human skill can devise.

Also Lanza Continuous Diagram Appliance—Reducing Wheels—Boiler Test Pumps—Vacuum Pumps—Planimeters—Electrically Operated Chime Whistles—Valves for Steam, Ammonia, etc.

All CROSBY Quality



Crosby New Indicator

Address any of our stores and you will receive a prompt and courteous reply.

J. E. LONERGAN CO.

211-215 RACE ST., PHILADELPHIA, PA.

Manufacturers of Boiler, Steam and Gas Engine Specialties

QUALITY  GAUGES



Pressure Gauge



Ammonia Gauge



Hydraulic Gauge

Pressure Gauges for steam, water or air, or vacuum. Pressure gauges graduated to any pressure not exceeding 500 lbs. Vacuum gauges graduated to 30".

Type "D" Short Spring, strong, non-freezable.

Model "GAS" Short Spring, strong, non-freezable, with Auxiliary Helical Spring attached to end of main spring, lengthening life of gauge where fluctuation of pressure or vibration is excessive.

Model "GDS" Double Spring, strong, non-freezable, made of one piece of seamless drawn bourdon tubing, insuring accuracy.

Pressure and Vacuum Gauge: Generally used on Compound Engines, Receivers, and Heating Systems.

"Combination" Water Works Gauge: Used to indicate pressure of water per square inch and corresponding height of column of water in feet. Adapted for use in Water Works, Pumping Stations, Mines, Stand Pipes, etc.

"Altitude" Gauge: Used to indicate height of water in feet in tanks, reservoirs and in connection with Hot-water House-heating Systems. Are generally graduated to 70 feet.

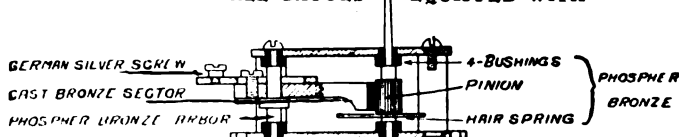
Double and Auxiliary Spring "Locomotive" Gauges.

"Ammonia" Gauge: Made expressly for use with ammonia and other liquids affecting brass. Tubes are made of a very high grade steel and carefully tempered. For use on ice and refrigerating machines.

"Tractor Engine" Gauges: Generally graduated to 300 lbs.

"Hydraulic" Gauge: Can be graduated to any pressure not exceeding 20,000 lbs. per square inch.

ALL GAUGES EQUIPPED WITH



Non-Corrosive Movement—Sectional View

Mechanical Men simply read our SPECIFICATIONS and are convinced.

"Movement" for all of our high-grade gauges.

All wearing bearings have PHOSPHOR BRONZE BUSHINGS twice their diameter in length. Sector, cast bronze, with face three times as wide as the regular sector.

Pinion, Arbor and Hair Spring, made of PHOSPHOR BRONZE.

This insures a gauge with exceptional wearing qualities, long life and accuracy.

"Springs" made for hard work.

Sector suspended vertically which reduces wear on teeth of sector and pinion to a minimum.

"Dials" all graduated by hand, made of brass, silver plated with black lettering.

UNITED STATES GAUGE CO.

67 WALL ST., NEW YORK, N. Y.

WORKS: SELLERSVILLE, PA.

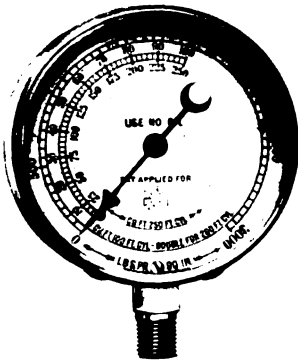
CHICAGO

DETROIT

SAN FRANCISCO

MONTREAL

Manufacturers of Pressure Gauges Exclusively



TRADE MARK

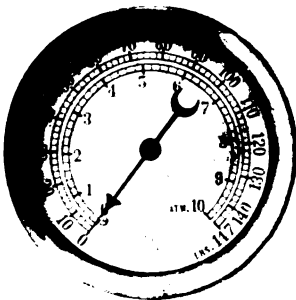
OXY-ACETYLENE GAUGES

Graduated to indicate pressure and cubic feet in standard oxygen cylinders. Patented safety features comprise solid cast front and full back safety release.



U. S. Navy standard heavy bushed movement with $\frac{1}{8}$ " face cast phosphor bronze segment and German silver pinion and arbors. Bearings deep bushed to give a bearing surface $1\frac{1}{2}$ " diameter long. Specially adapted for severe vibration service conditions.

529



UNIVERSAL GAUGES

U. S. Standard Universal Dial Gauges, combining the American and metric standards, meet all export requirements.

IF IT'S A GAUGE WE MAKE IT

THE BRISTOL COMPANY

WATERBURY, CONN., U. S. A.

Boston
Old South Bldg.

New York
114 Liberty St.

Pittsburgh
Frick Bldg.

Chicago
Monadnock Bldg.

San Francisco
Rialto Bldg.

Manufacturers of Bristol Recording Instruments for Pressure, Temperature, Electricity and Motion



Recording Gauge

BRISTOL'S RECORDING GAUGES for steam, air, gas and liquids. For all ranges of pressure and vacuum.

BRISTOL'S RECORDING LIQUID LEVEL GAUGES for automatically recording depths or levels of water or other liquids.



Indicating Pyrometer



Recording Thermometer

BRISTOL'S RECORDING THERMOMETERS for all commercial ranges of temperature from 60° below zero to 800° F.

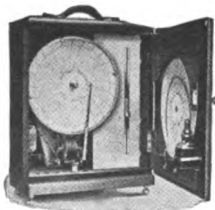
BRISTOL'S INDICATING ELECTRIC PYROMETERS High Resistance Model, for measuring temperatures up to 3000° F.



Recording Pyrometer

BRISTOL'S RECORDING PYROMETERS, High Resistance Model, for recording temperatures up to 3000° F.

BRISTOL'S RECORDING VOLT METERS, AMMETERS AND WATT-METERS for all ranges of A. C. and D. C. Can be furnished for switchboard or portable service.

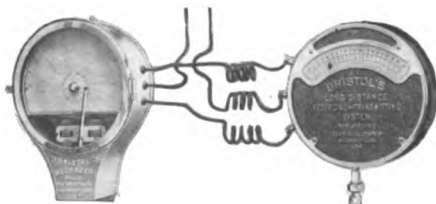


Portable Voltmeter

BRISTOL'S ELECTRICAL AND MECHANICAL TIME RECORDERS for recording time and mechanical movements, machine operation, valve reversals, etc.



Operation Recorder



Long Distance System

BRISTOL'S PATENTED LONG DISTANCE ELECTRIC TRANSMITTING AND RECORDING SYSTEM for measuring and recording at remote points, pressure, liquid level, temperature and motion. For instance, records may be transmitted over distances of five miles or more.



Electric Temperature Controller

BRISTOL'S ELECTRIC TEMPERATURE CONTROLLER for measuring and controlling temperatures in gas and electric furnaces.

THE BROWN INSTRUMENT CO.

PHILADELPHIA, PA.

NEW YORK

PITTSBURGH

DETROIT

CHICAGO

Manufacturers of Pyrometers, Thermometers, Tachometers, Time and Operation Recorders, Recording Gauges, Voltmeters and Ammeters

Brown Pyrometers

Probably the most largely used Pyrometers in the world. Operate on the thermo-electric principal. Adapted for all ranges of temperatures from 300° F. to 3000° F. For temperatures below 300° F., Brown Resistance Thermometers are recommended. For temperatures above 3000° F., the Brown Radiation Pyrometer is extensively used.

Brown Recording Pyrometers

Make a permanent record of temperatures—single or multiple charts as desired. Positive in action, sturdy in construction, accurate and with clear readings.

Brown Pyrometers are also made to regulate or control automatically the temperature of electric, gas, and oil furnaces.

Brown Recording Thermometers

Operate on the well-known principle of the expansion of gas or liquid with change of temperature. The Capillary tube, which connects Bulb and Recording Gauge, can be as long as 100 ft. Fitted with flexible steel-armored tubing. Sturdy in construction to withstand severe service.

Brown Tachometers

Indicating and Recording types for measuring and counting revolutions per minute. The Electric type records machine operations hundreds of feet away. The Mercurial type operates by the unvarying law of centrifugal force.

Other Scientific Instruments

Thermometers of the Mercurial type, pressure gauges, recording gauges, temperature controllers, time recorders, and vacuum gauges are among other scientific instruments produced in our Laboratory, Wayne Junction, Philadelphia.

Anyone visiting Philadelphia will be most welcome to call and inspect the manufacture and design of the Brown line.

CHARLES ENGELHARD

HUDSON TERMINAL BUILDINGS
30 CHURCH ST., NEW YORK, N. Y.

ENGELHARD LE CHATELIER PYROMETERS



Engelhard Le Chatelier Pyrometers have been the standard high temperature measuring instruments for the past twenty-five years. Their range is up to 1600° Centigrade (3000° F.). Interchangeability is guaranteed within $\pm 3^{\circ}\text{C}$.

Engelhard Pyrometers are supplied in a great many forms for industrial purposes. They are designed and constructed for the particular work to which they will be put. This assures the highest degree of practicability and long service.



Indicators and Graphic Recorders can be supplied in several types and ranges. All Engelhard instruments have a higher resistance per millivolt than other similar instruments available.

ELECTRIC RESISTANCE THERMOMETERS

Range -330° to $+1300^{\circ}\text{F}$. Interchangeability guaranteed within $\pm 1^{\circ}\text{C}$. Supplied in portable or switchboard form, and either Indicating or Graphic Recording.



Temperature at any number of points can all be measured at a central point by merely pressing a button.

The thermometer spirals are of chemically pure platinum actually imbedded and hermetically sealed in quartz glass, this assuring permanence of calibration and high accuracy.

THE FOXBORO COMPANY, INC.

FOXBORO, MASS.

Indicating, Recording and Controlling Instruments for Pressure, Temperature, Speed, Time and Flow

NEW YORK CHICAGO PHILADELPHIA PITTSBURGH DETROIT
ST. LOUIS BIRMINGHAM SAN FRANCISCO



FOXBORO
TRADE MARK



FOXBORO-HEATH CO₂ RECORDERS

Operated by water syphon with a minimum lag between stack and instrument. Simple in operation. Make a complete flue gas analysis every three or four minutes. Record shows percentage of CO₂. A practical and dependable instrument.

FOXBORO PYROMETERS

For any heat treatment of any metal. Stationary or portable. Fire bars and thermocouples interchangeable. Recording Pyrometer or "Tapalog" records 1 to 6 separate temperatures on one chart.



533



FOXBORO RECORDING THERMOMETER

Adapted for any operation where an accurate knowledge of temperature is needed. Any range from -60° to 1000° Fht., or equivalent degrees in Centigrade and Reaumur. No multiplying devices used. Permanency guaranteed.

FOXBORO RECORDING GAUGES

New inverted type will not allow ink to run down pen arm and blot the record. Any range from full vacuum to 20,000 lbs. per square inch. For Steam, Gas, Water, Oil, Air, Brine, Ammonia—in fact, anything under Pressure or Vacuum.



Write direct or to any branch office for complete information regarding Foxboro instruments.

THE SCHAEFFER & BUDENBERG MFG. CO.

BROOKLYN, NEW YORK

CHICAGO

PHILADELPHIA

WASHINGTON

LOS ANGELES

PITTSBURGH

Instruments for Measuring, Indicating, and Recording Temperature, Pressure and Speed

S & B GAUGES: A complete line of Pressure, Vacuum and Draft Gauges for all requirements, also Column Gauges, Mercury Pressure and Vacuum Gauges, Gauge Testers, etc.

"CRESCENT" THERMOMETERS

Among our line of high grade "Crescent" Thermometers will be found an instrument for practically every purpose, and our catalog No. 200 illustrates over seventy types. Handsome in appearance and perfect in mechanical detail and construction.

Specify size of scale case desired, graduation, character and size of connection, character and length of stem, and the purpose for which the thermometer is to be used.



"Crescent" Thermometer

"REFORM" THERMOMETERS



"Reform" Thermometer

A dial face, mercury-filled indicating thermometer having the accuracy of the standard glass tube thermometer and the conveniences of a dial face instrument. Entire working mechanism is made of steel, meaning long life. Standard size of dial 6 inches. Other sizes made to order. Furnished with either rigid connection or flexible capillary steel tube connection. The latter greatly facilitates installation. State the graduation desired, character and length of connection, and the purpose for which the thermometer is to be used.

"COLUMBIA" RECORDING THERMOMETERS

The most simple, yet the most reliable type of Recording Thermometer. Mercury actuated, therefore absolutely accurate. Steel construction throughout combining extreme strength and durability with accuracy. Uniformly graduated, wide and effective ranged charts with the popular day and night border, made in two sizes, 8" and 12", respectively, for 24 hours or 7 days. Furnished with either rigid connection or flexible steel protected steel capillary connecting tubing of any length. State size of chart and graduation, length and character of connection and the purpose for which the recorder is to be used.



"Columbia" Recording Thermometer

THE "COLUMBIA" RECORDING GAUGE

An exceptionally accurate and reliable instrument adaptable for all ranges of pressure, vacuum and draft. In portable and stationary types, for 8" and 12" day and night charts, respectively, making one revolution in 24 hours or 7 days as desired.

State size of chart and graduations, and the purpose for which the Recorder is to be used.



The Columbia Recording Gauge

"COLUMBIA" TACHOMETERS

We have a most complete line of Hand and Stationary Tachometers and we have recently added many new styles and types, covering absolutely every requirement met with in practice. Constructed on the most modern principles, accuracy guaranteed, compact and durable in construction, perfect in mechanical detail and handsome in appearance.

State desired graduations and if Stationary Type Tachometer is wanted, the diameter and the normal speed of the shaft you will drive from.



"Columbia" Tachometer

CALORIMETERS



Calorimeter

We manufacture Professor Carpenter's pattern Calorimeters for Steam. The throttling type of Steam Calorimeter serves for determining the amount of moisture contained in steam. The Separating type is designed to show the percentage of water by mechanical separation of the water from the steam.

S & B Calorimeters are easily operated, requiring no technical knowledge, and results are most satisfactory for practical purposes.



C. J. TAGLIABUE MFG. CO.

18 to 88 THIRTY-THIRD STREET, BROOKLYN, N. Y.

BRANCH OFFICES

BOSTON

CHICAGO

PITTSBURGH

NEW ORLEANS

SAN FRANCISCO

**Manufacturers of Instruments for Indicating, Recording and Controlling
Temperature, Pressure and Liquid Levels**

MERCURIAL THERMOMETERS

Hohmann-type, as well as types of lower quality, in various sizes, forms and scale-ranges, for the requirements of

Stationary Power Plants

Marine Power Plants

Refrigeration Systems

Water Cooling and Distillation

Ventilating and Heating

Industrial Plants, etc.

AUTOMATIC CONTROLLERS

Of several types and various forms, according to requirements, for automatically maintaining—at exact point desired—either temperature, pressure or level when applied to

Condensers

Forced and Induced Draft

Feed Water Heaters

Systems

Hot Water Service Tanks

Water Purification

Stoker and Blower Systems

Condensing Systems

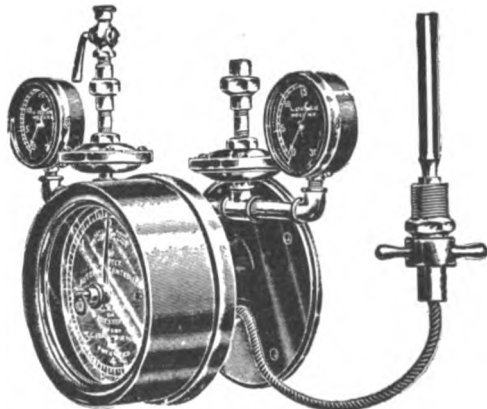
Industrial Apparatus, etc.



Hohmann-type
Thermometer

OIL TESTING INSTRUMENTS

Hydrometers, Viscosimeters, Flash and Burning Point Testers, Freezers, Gage and Wantage Rods, Boiling and End Point Tester for Gasoline, Etc.



"Perfect" type Automatic Temperature Controller

TAYLOR INSTRUMENT COMPANIES

INDUSTRIAL DEPARTMENT

ROCHESTER, N. Y.

Manufacturers of a Complete Line of Instruments for the Indicating, Recording and Regulating of Temperature and Pressure

NEW YORK
Bank of Metropolis Bldg.,
31 Union Square

CHICAGO
Heyworth Bldg.,
29 E. Madison St.

BOSTON
44 High St.

PHILADELPHIA
1318 Stephen Girard
Bldg.

WASHINGTON
327 Colorado Bldg.

St. Louis
Frisco Bldg., 906 Olive St.

TORONTO
201 Royal Bank Bldg.



Tykos Recording Thermometer

TYCOS RECORDING THERMOMETERS
give continuous records of temperature. Made in both self-contained and flexible tube form (mercury actuated and vapor tension types) for all industrial applications. Range—40° to 1000° Fahr.



Tykos Temperature and Pressure Regulator

TYCOS AUTOMATIC TEMPERATURE AND PRESSURE REGULATORS for processes requiring uniformity of temperature or pressure conditions. Type "A" illustrated above has a separable sleeve. Regulator can be removed from tank without drawing off contents.

TYCOS PYROMETERS

Base Metal—0 to 2200° F.
Rare Metal—0 to 3000° F.

FERY AND FOSTER RADIATION PYROMETERS

No upper limit of range.
All forms furnished in single or multiple outfits, Indicating or Recording.
All Tykos Recording Pyrometers furnish ink records on charts having Rectangular coordinates.



Tykos Pyrometer

TYCOS

'THER O-TYME' TEMPERATURE REGULATOR

Automatically controls the length of time required to reach a fixed temperature as well as controlling the temperature after it has reached this maximum. Especially adapted to industrial applications requiring a gradual increase of temperature to a certain point and then control at this point without fluctuation.



Tykos Pyrometer Switchboard

If interested in Temperature Regulators, Pressure Regulators, Recording Thermometers, Angle and Straight Stem Thermometers, Engraved Stem Thermometers, Hygrodeiks and Hygrometers, Thermo-Electric and Radiation Pyrometers, our catalogues are indispensable—May we place them in your hands? Name type of instrument in which you are interested.



H & M Indicating Thermometer for Stack Temperatures

WESTON ELECTRICAL INSTRUMENT COMPANY

49 WESTON AVE., WAVERLY PARK, NEWARK, N. J.

Manufacturers of Instruments for Every Field of Electrical Measurement

New York
Buffalo
Cleveland
Cincinnati

Boston
Philadelphia
Richmond
Pittsburgh
Florence

Chicago
Detroit
St. Louis
San Francisco
Johannesburg, South Africa

Denver
Toronto
Winnipeg
Vancouver

Montreal
London
Paris
Petrograd

Weston

ELECTRICAL INDICATING INSTRUMENTS

An A. C. or D. C. Instrument for every purpose—laboratory, central station, or for any form of commercial electrical measurement or testing.



**A. C. Switchboard
Wattmeter, Model 187**

The Weston A. C. Switchboard Instruments are unrivalled with respect to mechanical and electrical design and workmanship and hence with respect to performance.

Competent Engineers know that these Weston Instruments are the only types that meet perfectly the practical requirements of service, and they likewise know the initial cost is little if any more than the cost of inferior instruments, and that because of their continuous accuracy and serviceability these Weston Instruments are much more economical to adopt than instruments of any other make.

Model 1 Portable D. C. Voltmeters are guaranteed to an accuracy of $\frac{1}{6}$ of 1% (in terms of full scale length). They are dead-beat. The knife-edge pointer traveling over a mirror permits readings within $\frac{1}{10}$ of a division at any part of the hand-calibrated scale.

In external appearance these Model 1 Instruments are very handsome. The metal case has an exceedingly durable royal copper finish. The base is of selected mahogany, highly polished.



Model 1

Weston A. C. Switchboard Instruments are fully described in Catalog 16. Model 1 and the various other D. C. Portable Instruments are described in Bulletin 501.

No matter what your requirements may be, state them and we will forward appropriate Bulletins.



SLOCUM, AVRAM & SLOCUM LABORATORIES, INC.

531-537 West 21st St., NEW YORK CITY, U. S. A.

Manufacturers of the Productograph

The *Productograph* gives an absolute and correct record of lost time, productive working time, average speed and output, and it enables the Manager to put his hands on the weak links of his organization.

COMPONENT RECORDING FEATURES OF THE PRODUCTOGRAPH.

(1) Chart for recording total production, also productive and non-productive time. (2) Counter for reckoning total production.

The Productograph proper and its accessories have a special advantage in that each accessory forms a unit in itself. This arrangement makes it possible to supply the instrument fully equipped or with any combination of recording features in order to meet the requirements of any type of plant.



The Productograph

"An Instrument
for Recording
Efficiency
of Machines"

Description: The Productograph is designed to graphically record a complete history of the operations of machinery in a plant irrespective of what is being manufactured. Special switches are installed on the different machines throughout the plant and from these switches wires are brought to the Productograph located in the central office.

With this arrangement the operation of each machine is recorded, thereby providing accurate and immediate information covering the production and time loss of any machine in the plant.

The Productograph has been used in the following industries within the past three years: Molding, printing, lithographing, cloth finishing, cloth printing, rope making, brick making, box making, screw making, textile manufacturing, shrapnel, and motor car manufacturing.

To Engineers: At the present day of high cost of labor, it is essential that operation costs be minimized. The Productograph will give accurately a minute to minute record on every phase of an organization.

It is therefore essential that engineers familiarize themselves with this instrument, so that they may intelligently recommend its use whenever it can be advantageously used.

Irrespective of the nature of the requirements which may be desirable for any class of manufacturing plant, the Productograph is capable of executing the demands.

Further information will be furnished upon request, also data regarding:

(1) The "Productograph Electric Counter" which counts the product or manufactured units by measurement or quantity.

(2) The Accumulator which records the actual producing time in hours, minutes and seconds of any machine in the factory, also denoting whether or not that machine is producing.



TRADE MARK

JAMES G. BIDDLE

1211-1213 ARCH ST., PHILADELPHIA

Industrial and Scientific Instruments

FRAHM VIBRATING-REED TACHOMETERS

The Frahm Tachometer is an instrument for measuring revolutions per minute, which is always "on the job," silently, continuously, accurately indicating speeds of the machine to which it is attached.

This remarkable achievement in tachometer construction results from a very simple application of the well-known principle of resonance. A classic illustration of this principle is to be found in two tuning-forks, each one of which develops the same number of vibrations. The prime-mover (or machine) to which a Frahm Tachometer is attached, corresponds to the first tuning-fork, and the instrument itself corresponds to the second one. Because it is practically impossible to perfectly balance any machine which contains rotating parts, each revolution produces a distinct impulse. For example, if a dynamo runs at 1000 R. P. M. there will be 1000 separate impulses per minute. Then if the Frahm Tachometer is calibrated properly, it will "respond"—just as the second tuning-fork does—and correctly indicate the speed. The practical application of this principle to industrial instruments, by Dr. Frahm, has required brilliant development work.



Frahm Tachometer with
Two Rows of Reeds

Special Characteristics of Frahm Vibrating-Reed Tachometers.

Rugged Construction: There are no complex interior parts—such as delicate springs, jeweled bearings, pivots, pointer attachments, centrifugal weights, magnets and connecting wires. Practically nothing except a set of steel reeds, suitably mounted.

Simplicity of Mounting: No belt, gears, couplings or electrical connections are required—as it is only necessary to screw the Tachometer to a convenient part of the machine under test.

Permanent Accuracy: If accurate when installed—and that is merely a detail of manufacture—the instrument continues to be correct over long periods of constant duty; because the working parts do not change perceptibly with time.

Small Up-Keep Cost: Except in the case of an accident, a Frahm Tachometer will indicate speeds, year after year—twenty-four hours per day—without giving trouble of any kind. The instruments which come back to us for repairs represent so small a proportion of the total number in use as to be quite negligible.

Frahm Tachometers are best suited for indicating speeds between 900 and 8000 R. P. M. For service outside these limits, a special actuating device must be used. After being thoroughly tried out under long-continued service conditions, these unique tachometers are being used by all builders of steam turbines. In many cases they are included as part of standard equipment—and in others are specified by purchasing engineers. Their field of greatest usefulness includes steam turbines, centrifugal pumps, centrifuges, turbo-blowers, dynamos, motors and all other machines that run at speeds between the limits above specified.

For full description and Price-List consult Catalog 855, free on request.

OTHER BIDDLE SPECIALTIES

Jagabi Direct-Reading Hand Tachometers; for speeds up to 12000 R. P. M.

Jagabi Hand Tachoscope; for speeds up to 20,000 R. P. M.

Jagabi Electro-Magnetic Tachometers; for permanent attachment to hydro-turbines, engines, generators, etc., that run at speeds below 1000 R. P. M.

Also Megger Testing Sets and Bridge Meggers; Evershed Low Range Ducters; Laboratory and Portable Voltmeters, Ammeters, Wattmeters, Shunts, Multipliers and Transformers; Frahm Vibrating-Reed Frequency Meters; Laboratory Rheostats, Etc.

DURANT MANUFACTURING CO.

MILWAUKEE, WIS.

Manufacturers of Automatic Counters

The Productimeter

keeps an accurate record of production as it is made or operations as they are performed; is made in several different styles for adapting it to practically every kind of application in which counters can be successfully used. Each model is also made in different sizes, resetting and non-resetting, plain and with lock to prevent tampering by operators. Every Productimeter is subjected to the most rigid machine tests and thorough inspection before shipment, so that its count may be relied upon absolutely.



MODEL A

A ratchet counter of extremely substantial construction, easily reset, adapted particularly to stamping presses, punches, etc. It is also supplied with alarm bell for special applications.

Style	No. of Figures	Counting up to	Size Inches	Weight Pounds
4A-1	4	9999	7 x 2 1/4 x 1 1/4	3
5A-1	5	99999	8 1/2 x 2 1/4 x 1 1/4	3 1/2
6A-1	6	999999	10 x 2 1/2 x 1 1/4	4

MODEL B

A compact, full-geared positive counter with instantaneous reset. Can be secured to a vertical or horizontal surface and the operating lever can be placed in any position at either end of case, adapting it to an exceptionally broad range of uses.



	Size, Inches	Weight, Pounds
Standard with outside reset, 5 B-1.....	3 1/4 x 2 1/2 x 2 1/4	2 1/4
Rotary Drive outside reset, 5 B-7.....	3 1/4 x 2 1/2 x 2 1/4	2 1/4
With Lineal Measure Attachment, 5 B-8.....		7
Above with 61 Fig., 6 B-1.....	4 1/2 x 2 1/2 x 2	3 1/4



MODEL C

Designed for unusually severe usage. Thoroughly rust-proof. Particularly adapted to engines, compressors, automatic scales, coal handling machinery, etc.

Size, Inches	Weight, Pounds
4 1/2 x 3 x 2	3 1/2

Made in 4, 5, and 6 figures resetting or non-resetting.

MODEL D

A small, compact counter with a sturdy, accurate driving mechanism, instantaneous reset, and light action; adaptable to small presses and other light machinery. The rotary type is more heavily built and adapted to looms and other textile machines.



	Size, Inches	Weight, Pounds
Standard with outside reset, 5 D-1.....	2 x 1 1/4 x 1 1/4	8
Rotary drive with outside reset, 5 D-6.....	2 1/4 x 2 x 1 1/4	14

Made with 4 or 5 figures.

Also Round Case Engine Revolution Counters; Electric Counters; Pneumatic Counters.

Send for Productimeter Catalog No. 10.

DATA SECTION

PART I

A. S. M. E. Standards

541

Pages 543-573

INDEX TO A. S. M. E. STANDARDS

	PAGE
I OUTLINE OF PROCEDURE IN CREATING STANDARDS	545
II REVIEW OF WORK OF STANDARDS COMMITTEES.....	547
III ENUMERATION AND ABSTRACTS OF STANDARDS.....	554
Abbreviations, Standard.....	565
Abrasive Wheels, Safety Code for.....	570
Boiler Plate, Specifications for.....	564
Boilers, Steam, Specifications for.....	570
Trials of.....	555, 560
Briggs Pipe Threads.....	555, 568
Building Materials, Methods of Testing.....	555, 558, 559
Castings, Iron, Results of Tests of.....	559
Steel, Specifications for.....	564, 565
Catalogues, Standardization of.....	567
Comparator, Rogers-Bond.....	554
Constitution and By-Laws of the Society, Revised.....	564
Conveying and Hoisting.....	568
Cranes, Code of Safety Standards for.....	573
Cross-Sections for Drawings, Standard.....	569
Dynamos, Standards for.....	561, 565
Electric Generators, Standards for.....	561, 565
Lamp Socket Screw Threads.....	570
Electrical Code, National.....	560, 564
Ethics, Engineering.....	568
Flange Standardization (Schedules).....	558, 560, 563
Gages, Pipe-Thread.....	568
Standard Thickness.....	559
Hoisting and Conveying.....	568
Hose Couplings, Specifications for.....	568
Iron Castings, Results of Tests of.....	559
Locomotive Economy Tests.....	559, 566
Locomotives, Progress Report on.....	569
Machine Screws, Standard Proportions for.....	566
Shop Practice, Developments in.....	566
Management, Industrial, State of Art of.....	567
Metals, Non-Ferrous, Effect of Annealing, etc.....	565
Metric System, Report on.....	562
National Electrical Code.....	560, 564
Natural Gas for Industrial Purposes.....	554
Pipe Flanges and Fittings (see Flanges).	
Threads, Briggs Standard.....	555, 568
Threads, Straight, Standards for.....	571
Unions, Malleable.....	562
Power-House Piping, Colors for Identifying.....	566
Power Test Code.....	571
Pumping Engines, Duty Trials of.....	557
Refrigeration, Standard Tonnage Basis for.....	565
Rivet Steel, Specifications for.....	564, 565
Rogers-Bond Comparator.....	554
Snow Removal.....	569
Steam Boilers, Specifications for.....	570
Boiler Trials.....	555, 560
Engines, Tests of.....	558, 563, 564
Steel Castings and Forgings, Specifications for.....	564, 565
Structural Materials, Methods of Testing.....	556, 557, 559, 560
Symbols and Abbreviations, Standard.....	565
Tension Pieces, Comparison of Standard Shapes of.....	557
Testing Materials, Scientific Methods of.....	556
Thickness Gages, Standard.....	559
Unions, Malleable Pipe.....	562

I OUTLINE OF PROCEDURE IN CREATING STANDARDS

Soon after its foundation in 1880, The American Society of Mechanical Engineers instituted the procedure of creating standards of method and dimensional standards and of issuing such standards in printed form for general use. To date upward of fifty such standards, or codes, have been formulated, and some of them have been widely adopted and have become the basis of extensive manufactures.

The consideration of a proposed standard by the Society has usually been inaugurated as the result of its attention being called to diversities of proportions existing in similar pieces produced by different manufacturers; variances in methods of measurement of similar quantities; lack of a uniform basis of expression of certain facts; absence of interchangeability, etc.

Sometimes the absence of the standard, and the consequent necessity of it, has been pointed out by a competent authority in a paper embodying a resolution recommending the expediency of the Society considering the matter and reporting. Sometimes an interested party has addressed the Society requesting an opinion, which has later been made the basis of a standard. Sometimes the Society itself has recognized the necessity for a uniform procedure and has taken the initial step toward its creation.

545

In all cases, upon affirmative action by the Council of the Society, accepting the duty to formulate the standard, a committee of competent persons, members of the Society and other authorities, has been appointed to frame recommendations. Such committees have always been charged to take into their confidence all interested parties and to submit their findings to such parties for inspection and criticism before reporting them to the Society.

Reports of standards committees are presented at a general meeting of the Society and are, upon presentation, open for discussion by the whole membership and by others interested. Following such discussion, if, by vote, the recommendations still stand, the report is referred to the Council, who receive it and, upon approval by them, order it entered upon the record and printed in the **TRANSACTIONS** of the Society.

In cases where the field of action covered by a committee is very wide, viz., such as that of the Boiler Code Committee or the Power Test Committee, it has become the practice, on the acceptance of the committee's report and its subsequent discharge, to appoint a permanent committee to interpret the rules when called upon to do so, to make such revisions as may be found desirable, and to modify the rules to meet such new conditions as arise. These in-

terpretations and rules are formally approved at meetings of the permanent committee, and by letter ballot submitted to the members who could not attend the meeting. They are thereupon submitted to the Council, and if approved printed in *THE JOURNAL*. The permanent committee holds meetings from time to time at which all interested parties are given an opportunity to present suggestions with regard to the standards under consideration. These meetings constitute "revision periods" and take place at stated intervals, for instance, once in two or more years. All revisions of the codes or standards involving a change of meaning are reserved for these meetings, which may also take the character of "public hearings" so as to afford everybody interested an opportunity of stating his case in public.

546 Recent developments in the standardization work of the Society include the appointment, by amendment to the Constitution in the Spring of 1915, of the Standardization Committee as a standing committee of the Society. It is the function of this committee to standardize the method of making and arriving at standards rather than create standards themselves. This committee endeavors to bring about a unification of the standardizing work of the Society, and for this purpose national and international coöperation between organizations and governments, including an exchange of information with regard to standardization.

Finally there is the Standardization Committee of the National Engineering Societies to coöperate by representation on a proposed Joint Committee composed of three representatives each from the national engineering societies, to consider and report back to their respective societies suggested means of bringing about coöperation in the formulation of American Engineering Standards.

The Society is at all times prepared to formulate standards within its field of activity and to assist other organizations in the preparation of standards, and will, upon request, appoint members to serve on committees for this purpose. Several such coöperative committees are at work at the present time.

In introducing the following summary of the work of the standards committees and abstracts of standards reports, it should be reiterated that none of the reports are adopted by the Society. They are simply actions which carry weight and a recommendation but no further obligation. In practically all cases the standards have been accepted by outside parties, but of course without request by the Society. That they have been so widely incorporated bespeaks a recognition of the authority, ability and judgment exercised by the committees responsible for them.

II REVIEW OF THE WORK OF STANDARDS COMMITTEES

In this review of the activities to date of the professional committees of the Society in recommending standards, the material is grouped under the following principal heads:

- Testing Materials
- Boiler Specifications
- Power Tests
- Electrical Standards
- Flanges and Pipe Fittings, Screw Threads, Machine Screws
- Gages, Measuring and Recording Standards
- Safety Standards
- Miscellaneous.

Testing Materials. In 1890 the Committee on Standard Tests and Methods of Testing Materials presented its first report on methods of conducting standard or scientific tests, in contradistinction to routine or shop tests. It also issued the results of certain international conferences on testing materials with recommendations as to their adoption and incorporation in American practice (Paper 380). The year previous, the committee's first official paper had been printed, being Appendix II to the 1890 report and comprising resolutions of international conferences on testing materials (Paper 378).

In Papers 479 and 480 the committee recorded the proceedings of the third International Conference for the unification of standard methods of testing materials of construction held at Berlin in 1890. In Paper 550, of 1893, it urged the inauguration of international conferences for the unification of methods of testing, and also urged that the United States Government take cognizance of such conferences by the sending of duly accredited representatives.

In Paper 551, of 1893, were given the resolutions adopted by conferences at Munich, Dresden, Berlin, and Vienna, relative to uniform methods of procedure in testing building and structural materials. This paper supersedes Paper 378.

In Paper 654, of 1895, the committee took up the subject of standardization of castings and recorded the results of an investigation to show the relation between different sizes of castings poured from iron of a uniform composition; the chemical composition of each size of casting when cold, and also its physical properties.

In Paper 698, of 1896, were given the proceedings of the International Conference for the unification of methods of testing building and structural materials held at Zurich in 1895.

As a result of the formation of the American Society for Testing Materials, and its natural assumption of much of the work which this committee was doing and had planned to do, the latter did not present a final report, but the Society accepted each section and in 1900 discharged the committee.

The work has subsequently been carried on by the American Society for Testing Materials and by international congresses held from time to time, the first at Zurich in 1895, the second at Stockholm in 1897, the third at Budapest in 1901, the fourth at Brussels in 1906, the fifth at Copenhagen in 1909, and

the sixth at New York in 1912; the seventh, which was to have been held at Petrograd in 1915, has been indefinitely postponed.

Boiler Specifications. In the matter of boiler specifications, the first report was that of the Committee on Specifications for Boiler Plate, Rivet Steel, Steel Castings and Steel Forgings, which was made in 1903. (Papers 979 and 1026.) This report was only tentative, however, because of the formation at that time of the American Society for Testing Materials, which relieved the Society of much work on standardization of materials.

In September 1911 the Boiler Code Committee was appointed to formulate standard specifications for the construction of steam boilers and other pressure vessels and for their care in service. This committee completed a preliminary report in 1913,^r which was sent out to boiler manufacturers for inspection and criticism before the presentation of final recommendations to the Society. Subsequently, a draft report was printed and again subjected to severe criticism, in addition to a large amount of personal work being put into it by the individual members of the committee. Over forty organizations in all parts of the United States coöperated in this work by giving helpful suggestions or criticism.

The Boiler Code was discussed at Chicago in 1914, and again at the St. Paul-Minneapolis meeting in the same year. The discussion extended through six sessions of the Annual Meeting in New York in 1914, when the Boiler Code Committee presented its final report (Paper 1469).

The Boiler Code covers both new and existing installations, and deals with power boilers and heating boilers. Particulars are given in Paper 1469.

548

The Report recommended the appointment of a permanent committee to make such revisions of the rules as might be found desirable, and to modify them as the state of the art advanced, and that such committee should hold meetings at least once in two years, at which all interested parties might be heard. This recommendation was approved by the Council and the Committee accordingly appointed.

By Rules 331-4 of the Code, an official symbol or stamp (an enclosed "S") is to be used by the manufacturers to indicate that the Boiler Code Rules have been complied with in every detail in the construction of each boiler stamped with the symbol.

The American Uniform Boiler Code Congress assembled in Washington, D. C., December 1916, passed a resolution recommending that all states adopt it as standard, thus bringing standards, free interchangeability of boilers and efficiency together, to the end that manufacturers, users and inspectors might profit by the advantages of uniformity.

The first public hearing on the Boiler Code was held in December 1916 in the Engineering Societies Building and proved of unusual interest.

The Boiler Code Committee has held monthly meetings at which interpretations have been formulated for the cases presented to it for consideration. About 200 cases have been acted upon. During the past year the committee has engaged in extensive investigations in connection with a thorough revision of the Code and it is expected that a new edition will shortly be issued. A new locomotive-boiler section has been prepared by the Locomotive Sub-Committee and the subject of boiler inspection rules is also being considered.

Power Tests. In 1884 a Committee on Standard Methods of Steam-Boiler Trials presented its report. This was discussed at Atlantic City in 1885 (Paper 168) and is known as the Code of 1885.

The object of a steam-boiler trial was taken to be the determination of the quantity of steam that a boiler can supply continuously and regularly under definitely prescribed conditions, the conditions and commercial value of the steam, the character of the combustion and the actual conditions of operation of the boiler when at work.

In 1899 a Committee on the Revision of the Code of 1885 for Conducting Steam-Boiler Trials presented its report, which is known as the Code of 1899 and shows a marked development over the original code of 1885, giving especial consideration to the fuel question and also endeavoring to overcome difficulties encountered in the West with the first code. This code is printed in Paper 827, while Paper 828 gives the discussion on the report at the New York Meeting of 1899.

In 1890 the Committee on a Standard Method of Conducting Duty Trials of Pumping Engines presented a report to furnish a common basis on which to compare the economy of different engines, and proposed a new basis for economy of 1,000,000 B.t.u. in place of 100 lb. of coal (Paper 381).

In 1892 a committee reported on standards for tests of engines and machinery at the Columbian World's Fair with a view to giving them a real scientific and comparable value (Paper 503).

In 1893 the committee on a Standard Method of Conducting Locomotive Tests presented its report covering shop tests and road tests (Paper 552).

In 1902 a Committee appointed to standardize a system of testing steam engines presented its final report, known as the Code of 1902, which gives extensive rules covering the various phases of steam-engine tests (Paper 973). The discussion of this final report is given in Paper 974.

In 1904 the Society's Committee, coöperating as an advisory body with the Pennsylvania Railroad Company in conducting tests on locomotives at the Louisiana Purchase Exposition in St. Louis, presented its report (Paper 1109), and in 1914 the Sub-Committee on Railroads of the Committee on Meetings presented a report on steam locomotives of that day, summarizing the progress made since the Louisiana Purchase Exposition (Paper 1448).

In 1908 the matter of standardization of gas-engine tests was discussed, the discussion hinging mainly on gas-engine efficiency and heat value of gas, with arguments for the use of total-heat values and effective-heat values. A revised code for testing gas engines was submitted to the Council, with suggestions that the revision be placed in the hands of the Gas Power Section of the Society, now the Sub-Committee on Gas Power of the Committee on Meetings.

At the 1908 meeting a motion was carried providing for the revision of the report, then about three years old, on standard methods for conducting tests of gas engines. It was suggested that it would be desirable to revise the standards for testing of engines, placing all upon the heat-unit basis, the only proper basis for a duty test of an engine or for engine guarantee.

In 1909 the Committee on Revision and Extension of the Code for Testing Gas Power Machinery requested that their committee be discharged and suggested that a new committee be appointed to revise, unify and standardize all the present codes of the Society covering their various subjects. The Committee on Revision of the Standard Code on Steam-Boiler Tests also recommended that a revision be undertaken and a committee be appointed. It was voted that a committee of nine, to be named The Committee on Power Tests, be appointed to "revise the present testing codes of the Society relating to boilers, pumping engines, locomotives, steam engines in general, internal-combustion engines

and apparatus and fuel therefor, and to extend these codes so as to apply to such power-generating apparatus as the present codes do not cover, including water power, and bring them into harmony with each other and with the best practice of the day." This committee was given power to resolve itself into as many sub-committees as might be required, the sub-committees to coöperate with and report to the whole committee. The final report of the Power Test Committee was presented at the Annual Meeting in 1915 and is printed in Paper 1526. Subsequently a permanent committee was appointed to interpret the rules and to make revisions from time to time, also to hold meetings at which interested parties might have an opportunity to present suggestions, following the precedents of the Boiler Code Committee.

At the Annual Meeting, December 1917, a public meeting was held by the Power Test Committee for the discussion of the various sections of the Power Test Code and the suggestions made at that time are being used as the basis for the revision of the code.

During the past year a sub-committee was appointed to assist in the revision of the water-wheel section of the code.

Electrical Standards. In 1897 the National Conference on Standard Electrical Rules presented its report, known as the National Electrical Code. This code (Paper No. 790) gives seventy-two rules divided into six classes. In 1903 the National Conference on Standard Electric Lighting Rules presented its report, proposing amendments to the National Electric Code Rules (Paper 977).

550 In 1901 the Committee on Standardization of Engines and Dynamos proposed standards for direct-connected engines and generators (direct-current—Paper 887), and in 1901 the committee presented a report embodying their final conclusions and recommendations (Paper 916). In 1905 the same committee presented an appendix to its report concerning the reduction of engine-shaft diameter beyond armature fit (Paper 1056).

In 1913 at the invitation of the American Institute of Electrical Engineers, a committee was appointed to coöperate with the Standards Committee and report concerning the use of the *myriawatt* as a unit. The report was presented at the Spring Meeting of that year.

In 1916 the Conference Committee on Electrical Engineering Standards considered the proposal to form a Joint Standards Committee with representation from all the national engineering societies, to act as a senate and give final approval to any standards proposed by the constituent societies.

The Conference Committee on Electric Power is coöperating with the Subcommittee on Cost of Electric Power of the Committee on Standards of the American Institute of Electrical Engineers.

Flanges. The Committee on Flange Standardization reported its first standards in Papers 481 and 504, in which a table of proposed standards was submitted. Paper 826 gives the schedule of standard flanges adopted in 1899. The continually increased pressures to be resisted and the increasing diameter of pipe for large power stations, however, called for extensions of this standard.

In December 1901 the Committee on Standard Pipe Unions presented its report based on joint conferences with committees of other societies (Paper 917), and a supplementary report in 1902 (Paper 948).

In 1912 a special committee on flanges, coöperating with the National Association of Master Steam and Hot Water Fitters, formulated the 1912 schedule of standard weight and extra heavy flanges and flanged fittings, which has

been adopted by the United States Government and by numerous organizations.

In 1913 the Committee on Standardization of Flanges presented recommendations as to a new standard to be known as the American Standard, to become effective January 1, 1914. This standard was arrived at after conferences with the Master Steam and Hot Water Fitters' Association and the Manufacturers' Committee, and is a compromise consistent with good engineering practice between the 1912 U. S. Standard heretofore recommended and that recommended in the same year by the manufacturers (Paper 1430).

During 1916 the Manufacturers' Standards Committee, representing companies manufacturing pipes and fittings, requested the coöperation of the Society's Committee on Standard Flanges and Pipe Fittings in the standardization of flanges for hydraulic work. Later this committee was asked to include flange fittings for ammonia apparatus and also steel fittings, and, by request of the American Railway Master Mechanics' Association, pipe unions. The title of the committee was changed to that of the Committee on Standards for Flanges and Pipe Fittings. The committee has lately been investigating the strength of the various sizes and weights of rolled-steel piping, thickness of pipe walls for cast-steel and semi-steel pipe and fittings, proportion for flanges, bolting and fittings for hydraulic pressures of 800, 1200 and 3000 lb. working pressure per square inch. A new report covering these high pressures has just been issued.

Screw Threads. A Committee on Standard Pipe and Pipe Threads formulated and recommended the Briggs standard, offered by the late Robert Briggs, of Philadelphia, a member of the Society. The report was presented in 1887; the standards are given in Papers 226 and 241.

551

A conference on the International Standardization of Pipe Threads was held in Paris, France, in 1908. The Society appointed a special committee whose report was forwarded for presentation at that conference. In 1913 the Committee on International Standards for Pipe Threads sent to the Paris representative instructions for presentation to the International Commission on Pipe Threads, which was initiated by the Société Technique de l'Industrie du Gaz in France. The American Gas Institute sent identical instructions to its representative.

The Committee on Standardization of Special Threads for Fixtures and Fittings presented its report in June 1915, giving standard dimensions for rolled threads for screw shells of electric sockets and lamp bases, and in December 1915 reported similarly for straight pipe threads (Papers 1474 and 1525).

In 1912 a committee was appointed to prescribe the permissible tolerances in the commercial manufacture of taps, bolts and screws, including their measurement. This committee is called the Committee on Tolerances in Screw Thread Fits and has rendered an elaborate progress report which was presented for discussion at the Spring Meeting of 1918. In preparing this report several thousand screws and bolts were inspected, a large number of special gages were made for trial use by manufacturers, and the theoretical aspect of the whole question was gone into with the utmost thoroughness.

Machine Screws. At the New York Meeting in December 1905 the Committee on Standard Proportions for Machine Screws presented its preliminary report, and at the Chattanooga Meeting in 1906 its completed report, with appended comment. This report was referred back for final revision.

At the New York Meeting in December 1906 a revised report was presented

and discussions read, but on account of numerous requests it was referred back to the committee for another revision, and the final report was presented and accepted at the Indianapolis Meeting in May 1907. (See Papers 1142 and 1142-A.)

The report has been adopted by the Navy Department of the United States and embodied in the Department's specifications.

Machine-Screw Nuts. In 1917, at the request of the Navy Department of the United States, a joint committee of the Society and of the Society of Automotive Engineers was appointed to consider the question of the standardization of machine-screw nuts. This committee has a report in preparation.

Committee on Screw Threads and Threaded Parts. In order to secure co-ordinated effort on the part of the various committees engaged upon the standardization of screw threads, an advisory committee has been appointed with a membership composed of members of these several other committees. This advisory committee aims to keep in touch with the requirements of screw-thread standardization and to assign standardization work to sub-committees as required.

Government Commission to Standardize Screw Threads. Through the passage of a bill by Congress, which this Society assisted in bringing about, a Government commission is being formed to undertake a national standardization of screw threads. The commission will be composed of two members from The American Society of Mechanical Engineers, two from the Society of Automotive Engineers, and one each from the Army, the Navy and the Bureau of Standards.

552

Gages. In 1882 a Committee on Standards and Gages reported on the Rogers-Bond Comparator (Paper 90).

In 1885 the Committee on a Standard Thickness Gage for Metals presented its report, recommending the use of the gage whose number for each thickness is the number of thousandths of a standard inch in that thickness (Paper 633).

In 1913 the Committee on Standardization of Pipe Threads Gages presented its report fixing manufacturing limits for the use of the Briggs Standard Pipe Thread Gages (Paper 1399).

Gage Committee. This committee was appointed to assist the Government in establishing and maintaining standard gages used in the production of munitions of war. The committee recommended that there be but one place for the certification of gages and that master gages be located in different industrial centers. The recommendations were generally accepted and the Bureau of Standards agreed upon as the place for certification.

Measuring and Recording Standards. In 1902 the committee appointed to discuss the arguments in favor of and against the Metric System presented a report giving the points of general agreement and also stating the pro-metric and anti-metric sides of the case (Paper 972).

In 1905 a committee presented a preliminary report on standard abbreviations, symbols, etc., in technical papers, giving fourteen rules with a list of examples (Paper 1054).

In 1905 the committee appointed to suggest a standard tonnage basis for refrigeration presented its preliminary report, confining itself to a thermal rating and the establishment of a set of conditions representing good average engineering practice (Paper 1055).

In 1913 the Committee on Standardization of Catalogues presented its

report recommending standard sizes for catalogues, folders, paper boxes, etc. (Paper 1394).

In 1914 the Committee on Standard Cross-Sections and Symbols presented its report (Paper 1468), and

In 1916 the Joint Committee on Standards for Graphic Presentation presented a preliminary report, which was published for the purpose of inviting suggestions.

Safety Standards. In 1915 the Sub-Committee on Machine Shop Practice of the Committee on Meetings presented a report, being a safety code for the use and care of abrasive wheels, covering protection flanges, protection hoods and protection chucks (Paper 1523).

In 1916 the Sub-Committee on the Protection of Industrial Workers of the Committee on Meetings presented a Code of Safety Standards for Electric Traveling Cranes, including rules for crane operators, floormen and repairmen (Paper 1572).

At the Spring Meeting in Cincinnati, May 1917, an Industrial Safety Session was held under the auspices of the Sub-Committee on Protection of Industrial Workers. Tentative drafts of two safety codes were presented and discussed and appear in final form in Vol. 39 of TRANSACTIONS. The first was a code of safety standards for industrial ladders (Paper 1597), and the second referred to safety standards for power-transmission machinery (Paper No. 1597). The latter was compiled under the direction of the Committee on Health and Safety of the National Association of Manufacturers. A code of safety standards for woodworking-machine guards was also presented at the Annual Meeting, 1917 (Paper No. 1631).

553

Miscellaneous. In 1884 a committee reported on Natural Gas for Industrial Purposes, including its chemical composition, illuminating power and industrial uses (Paper 151).

In 1904 the Alloys Research Committee presented an appendix to its sixth report, being a summary of various papers on effect of strain and of annealing (Paper 1034).

In 1911 the Committee on Identification of Power House Piping presented a report recommending distinguishing colors to be used on valves, flanges and fittings of steam, gas, water and other pipe lines, etc. (Paper 1305).

In 1912 the Sub-Committee on Machine Shop Practice presented a report on the Development of Machine Shop Practice through the Preceding Decade (Paper 1367).

In 1912 the Sub-Committee on Administration presented a report on the Present State of the Art of Industrial Management (Paper 1378).

The Sub-Committee on Fire Protection recommended a National Standard for Hose Couplings, which the Council ordered printed (Paper 1398). These standards are compromise standards which were agreed upon at a joint conference with a number of organizations interested

In 1913 the Sub-Committee on Hoisting and Conveying presented a report reviewing developments and making certain preliminary recommendations (Paper 1403).

In 1914 the Committee on a Code of Ethics presented its recommendations regarding engineers' relations to clients, employers, etc. (Paper 1429).

In 1914 the Committee on Resolutions of the Snow Removal Conference,

held in Philadelphia, presented a report reviewing methods adopted in the principal cities (Paper 1450).

In 1909 a Committee on Standards for Involute Gears was appointed to formulate standards and report to the Council. It presented a majority report four years later.

The Committee on Recommended Practice for Standardization of Filters presented its report at the Annual Meeting, December 1916. It is printed in Vol. 39 of TRANSACTIONS (Paper 1600).

III ENUMERATION AND ABSTRACTS OF STANDARDS COMMITTEES' REPORTS

In the following list are given, in the order of A. S. M. E. paper numbers, the reports of the various Standards Committees, with a short abstract of each paper. For more detailed information readers are referred to the volumes of TRANSACTIONS and THE JOURNAL of the Society, particulars of which are given with each abstract.

Reports on which no definite action has been taken as yet, and which do not, therefore, appear in this list, are mentioned under the heading Miscellaneous of the preceding summary.

Where reports have been superseded they are so marked. Prices of reports to non-members are included in the cases of reports still in force; prices to members are one-half those specified.

554

Paper 90

REPORT OF COMMITTEE ON STANDARDS AND GAGES, ON THE ROGERS-BOND COMPARATOR

Presented and discussed at New York, November 1882. Printed in Trans. Am. Soc. M. E., Vol. 4 (1883), pp. 21 to 29. (*Out of print*)

The comparator is used for comparing line measures of length with attested copies of the standard bars, subdividing these line measures and reducing them to end measures. The degree of accuracy attained is said to be such that no future improvements can occasion changes sufficiently great to affect the practical usefulness of the magnitudes determined or the interchangeability of structures based upon them with those involving further refinements.

Paper 151

REPORT ON NATURAL GAS FOR INDUSTRIAL PURPOSES

Presented and discussed at Pittsburgh, May 1884. Printed in Trans. Am. Soc. M. E., Vol. 5 (1884), pp. 340 to 375. 4 tables. (*30 cents*)

This report deals with the chemical composition of natural gas from Western Pennsylvania, its fuel value, illuminating power, and its uses in the industries; natural-gas piping practice, explosibility, pressure and temperature of gas from the well. It concludes with a discussion of the laws (34 P. L. 93) of Pennsylvania relating to water, gas, light and heat companies, and recommends further legislation. It also proposes measures to natural-gas consumers tending to security and economy.

Paper 168

REPORT OF COMMITTEE ON A STANDARD METHOD OF STEAM-BOILER TRIALS

Presented at New York, November 1884, and discussed at Atlantic City, May 1885. Printed in Trans. Am. Soc. M. E., Vol. 6 (1885), pp. 256 to 313. Discussion, pp. 314 to 351. 5 figs., 2 tables, 3 logs. (Superseded by Paper 827)

(CODE OF 1885)

The code proposed provides that the object of the test shall be precisely stated before the trial, and that an understanding be reached in regard to the kind of fuel to be used. During the trial the essential provisions are the preservation of the utmost possible uniformity of working conditions, the method of keeping the record of the test, and analyses of the escaping gases, when practicable.

The committee recommends as the "unit of evaporation" "one pound of water at 212 deg. Fahr. evaporated into steam at the same temperature." For "commercial horsepower" it accepts the unit of "an evaporation of 30 lb. of water per hour from feedwater into steam at 70 lb. gage pressure." (This standard is equal to 33,305 thermal units per hour.)

Paper 226

REPORT OF COMMITTEE ON STANDARD PIPE AND PIPE THREADS

Presented and discussed at New York, November 1886. Printed in Trans. Am. Soc. M. E., Vol. 8 (1887), pp. 29 to 44. 1 fig., 2 tables. (10 cents)

The committee expresses the opinion that the Briggs Standard is the proper standard to be adhered to, and that it only requires definite coöperation on the part of pipe manufacturers with the committee, in order to bring their product strictly to that standard and to adopt means of strictly adhering to it within practical limits. An appendix gives complete data upon which the Briggs standard pipe-thread sizes are based, and a table of standard dimensions of wrought-iron welded tubes up to 10 in. in diameter.

555

Paper 241

FINAL REPORT OF THE COMMITTEE ON STANDARD PIPE AND PIPE THREADS

Presented at Washington, June 1887. Printed in Trans. Am. Soc. M. E. Vol. 8 (1887), pp. 347 to 350. (10 cents)

This report is on the consideration of a standard for pipe threads for purposes other than that which is covered by the Briggs formulæ and tables.

Paper 378

APPENDIX II TO REPORT OF COMMITTEE ON STANDARD TESTS AND METHODS OF TESTING

Presented at New York, November 1889. Printed in Trans. Am. Soc. M. E., Vol. 11 (1890), pp. 527 to 572. 3 figs., 1 table. Index. (Superseded by Paper 551)

Resolution of the conferences held at Munich, September 1884, and Dresden, September 1886, relative to uniform methods of procedure in testing building and structural materials. (See Paper 380)

Paper 380

REPORT OF COMMITTEE ON STANDARD TESTS AND METHODS OF TESTING MATERIALS

Presented and discussed at Cincinnati, May 1890. Printed in Trans. Am. Soc. M. E., Vol. 11, pp. 604 to 653. 6 figs., 19 tables. Index. Appendix.
(Out of print)

Progress report on methods of conducting standard or scientific tests, in contradistinction to routine or shop tests, setting forth proposed recommendations under the following heads:

I General Recommendations

- 1 Necessary conditions of testing machines
- 2 Holding appliances
- 3 Standard apparatus for routine testing
- 4 Standard drop-test apparatus
- 5 Determination of those qualities of material which suggest its adoption
- 6 Remarks on testing machine to accompany reports
- 7 Amplification of reports by stating source of test pieces, etc., etc.
- 8 Influence of time on tests

II Tests of Wrought Iron and Steel

- A Rails
- B Axles
- C Tires
- D Wrought iron for structural purposes
- E Low steels for structural purposes
- F High steels for structural purposes
- G Wrought iron for boilers
- H Low steels for boilers
- I Materials used in shipbuilding
- J Wire
- K Wire rope

III Cast Iron

IV Copper, Bronze, and Other Metals

V Woods

VIII Method of Testing

- 1 General recommendations for testing finished pieces in original shape
- 2 Tension test in general
- 3 Compression tests
- 4 Transverse tests
- 5 Torsion tests
- 6 Multiple or piece tests
- 7 Welding tests
- 8 Bending tests
- 9 Hardening tests
- 10 Forging tests
- 11 Punching tests
- 12 Abrasion test

IX Shape of Test Pieces

- 1 For tension tests
- 2 For compression tests
- 3 For transverse tests
- 4 For torsion tests
- 5 For bending tests
- 6 Multiple or piece, welding, hardening, and abrasion tests.

The report also takes up the question of an international standard for testing materials, reviewing testing practice in France, Great Britain and Germany.

An addendum (see Paper 378) gives the general results and deliberations of a number of successful conferences held by German, Austrian, Swiss and Russian

engineers to adopt standard methods, test pieces and machines. Their recommendations having been introduced universally, and, being in all essential particulars identical with custom in Great Britain and the United States, the committee considers it advisable to incorporate them.

Paper 381

REPORT OF COMMITTEE ON A STANDARD METHOD OF CONDUCTING DUTY TRIALS OF PUMPING ENGINES (REVISED FORM)

Presented and discussed at Cincinnati, May 1890. Printed in Trans. Am. Soc. M. E., Vol. 11 (1890), pp. 654 to 687. 2 figs., 3 tables. Appendix. Discussion. Vol. 12 (1891), pp. 563 to 602. (Superseded by Paper 1526)

The main object of the standard proposed is to establish a mode of determining whether or not the guaranteed duty of a pumping engine is realized, and to furnish a common basis on which to compare the economy of different engines. The abolition of the unit of "100 lb. of coal" in favor of the new basis of "1,000,000 heat units" is proposed. Formulæ are recommended for computing duty and other quantities relating to performance.

In order that a contract between builder and purchaser may conform to the proposed standard, a number of guarantees stated are recommended. The report describes the standard method of conducting duty trials, under the headings:

- 1 Test of Feedwater Temperatures
 - Directions for obtaining temperatures
 - Directions for measurement of feedwater
- 2 Main Duty Trial
 - Mode of procedure
 - Directions regarding arrangement and use of instruments
- 3 Leakage Test of Pump
- 4 Table of Data and Results
 - Duty trial of engine
 - Data and results of boiler test.

557

An appendix contains memoranda in regard to measurement of water by means of weirs, venturi tubes and nozzles.

Paper 479

APPENDIX II TO REPORT OF COMMITTEE ON STANDARD TESTS AND METHODS OF TESTING MATERIALS

Presented for record at New York, November 1891. Printed in Trans. Am. Soc. M. E., Vol. 13 (1892), pp. 275 to 288. (10 cents)

Minutes of the third conference for the unification of standard methods of testing materials of construction, held at Berlin, September 1890. (See Paper 380)

Paper 480

APPENDIX IV TO REPORT OF COMMITTEE ON STANDARD TESTS AND METHODS OF TESTING MATERIALS

Presented for record at New York, December 1891. Printed in Trans. Am. Soc. M. E., Vol. 13, pp. 289 to 296. 2 figs (10 cents)

Lecture by Prof. N. Belebubsky, of St. Petersburg, on Comparison of Standard Shapes of Tension Pieces. (See Paper 380)

Paper 481

REPORT OF THE COMMITTEE ON FLANGE STANDARDIZATION

Presented at San Francisco, May 1892. Printed in Trans. Am. Soc. M. E., Vol. 13 (1892), pp. 307 to 317. Appendix. (See Paper 504)

A progress report giving the forms of inquiry used by the committee to obtain the necessary information for compiling standards.

Paper 503

REPORT OF COMMITTEE ON METHODS FOR PHYSICAL AND MECHANICAL TESTS ON STEAM ENGINES AND MACHINES AT THE WORLD'S COLUMBIAN EXPOSITION, 1893

Presented at New York, November 1892. Printed in Trans. Am. Soc. M. E., Vol. 14 (1893), pp. 41 to 47. (*Out of print*)

International expositions furnish an opportunity for careful tests of the relative merits of the various products, manufactures, machines and methods developed under different conditions in various parts of the world. This report enumerates the tests which it is desirable to undertake with references principally to prime movers and natural products, materials and apparatus used in connection therewith.

Paper 504

REPORT OF THE COMMITTEE ON FLANGE STANDARDIZATION

Presented at New York, November 1892. Printed in Trans. Am. Soc. M. E., Vol. 14 (1893), pp. 48 to 51. 1 fig., 1 table. (Superseded by Paper 826)

558

The committee submits a table of proposed standards, tables of sizes in use by manufacturers, and a plotted diagram showing graphically the suggested scale of sizes. Scales for two pressures are proposed for sizes of 24 in. and over, one for pressures ranging up to 80 lb. and the other to 200 lb.

Paper 550

REPORT OF COMMITTEE ON STANDARD TESTS AND METHODS OF TESTING MATERIALS

Presented at the Engineering Congress, Chicago, August 1893. Printed in Trans. Am. Soc. M. E., Vol. 14 (1893), pp. 1258 to 1261. (10 cents)

In this report the committee announces that it will present from time to time data and results from outside sources, the correctness of which has been developed and demonstrated at home or abroad.

Paper 551

APPENDIX V TO REPORT OF COMMITTEE ON STANDARD TESTS AND METHODS OF TESTING MATERIALS

Presented at the Engineering Congress, Chicago, August 1893. Printed in Trans. Am. Soc. M. E., Vol. 14 (1893), pp. 1263 to 1311. 3 figs. Index. (Superseded by Paper 378) (30 cents)

Resolutions of international conferences held at Munich, Dresden, Berlin and Vienna, relative to uniform methods of procedure in testing building and structural materials to determine their mechanical properties. This appendix supersedes Appendix II (Paper 378), in which a number of modifications must be made in order to make it agree with facts developed since the presentation of the appendix. The principal differences consist in rules for bending tests, tests of boiler plate, copper, and tiles, and finally the recommendations of a standard

length of test piece developed from the proven relation of length and cross-section of test piece on results.

Paper 552

REPORT OF COMMITTEE ON A STANDARD METHOD OF CONDUCTING LOCOMOTIVE TESTS

Presented and discussed at the Engineering Congress, Chicago, August 1893. Printed in Trans. Am. Soc. M. E., Vol. 14 (1893), pp. 1312 to 1339. 8 figs., 2 tables. (Superseded by Paper 1526)

The committee reports that for determining economy of boiler and engine, economy of compound and simple locomotives, and effect upon the economy produced by different classes of fuel and various methods of operation, the "shop test" is especially adapted; for determining other problems and to ascertain the performance of the engine in regular work, the "road test" should be used. In making road tests a dynamometer car should be employed, so as to obtain thereby the pull upon the drawbar. Tests should be conducted with such completeness that all the information relating to the performance of both the boiler and cylinders are determined.

As a standard basis for comparing efficiency, the number of pounds of standard coal burned per dynamometer horsepower per hour is recommended. The term "standard coal" refers to coal having a total heat of combustion of 12,500 B.t.u. per lb.

Paper 633

REPORT OF COMMITTEE ON STANDARD THICKNESS GAGE FOR METALS

Presented and discussed at Detroit, June 1895. Printed in Trans. Am. Soc. M. E., Vol. 16 (1895), p. 641. (30 cents)

The committee reports its success in bringing into acceptance the use of a gage whose number for each thickness is the number of thousandths of a standard inch in that thickness. Where a notched gage is used the suggested standard form is an oval gage, stamped with the words Decimal Gage.

Paper 654

REPORT OF COMMITTEE ON STANDARD TESTS AND METHODS OF TESTING MATERIALS

Presented and discussed at Detroit, June 1895. Printed in Trans. Am. Soc. M. E., Vol. 16 (1895), pp. 1066 to 1081

Results of an investigation showing the relation between different sizes of castings poured from iron of a uniform composition, the chemical composition of each size of casting when cold, and the physical properties of each. The tests were made in actual foundries.

The chemical composition represented all foundry mixtures from white iron to the softest gray; the physical properties determined were the grain, the shrinkage, the chill and the strength. Reports were made of the transverse, tensile and crushing strengths, and logs were included giving maximum fiber distance, moment of inertia, total stress, deflection, maximum stress on outer fiber, shearing stress, modulus of elasticity and resilience.

This report is supplemented by Paper 655, Transverse Strength of Cast Iron (review of results of above tests), by W. J. Keep; and Paper 656, Keep's Cooling Curves—A Study of Molecular Changes in Metals Due to Varying Temperatures, by the same author, and printed in the same volume.

Paper 698

APPENDIX TO REPORT NO. 380 OF COMMITTEE ON STANDARD METHODS OF TESTS AND TESTING MATERIALS

Published in *Trans. Am. Soc. M. E.*, Vol. 17 (1896), pp. 748 to 757. (10 cents)

Proceedings of the Fifth International Conference for the unification of methods of testing building and structural materials, held at Zurich, September 1895.

Paper 790

REPORT OF NATIONAL CONFERENCE ON STANDARD ELECTRICAL RULES

Presented at New York, November 1897. Printed in *Trans. Am. Soc. M. E.*, Vol. 19 (1898), pp. 984 to 1021. 3 tables. Index. (30 cents)

(NATIONAL ELECTRICAL CODE)

Rules adopted by a National Conference on Standard Electrical Rules composed of representatives from sixteen bodies, including the Society. The rules are divided as follows:

Class A: Central stations, dynamo, motor and storage-battery rooms, transformer substations, etc.....	Rules 1-11
Class B: Outside work all systems and voltages.....	Rules 12-13
Class C: Inside work.....	Rules 14-39
Class D: Specifications for wires and fittings.....	Rules 40-55
Class E: Miscellaneous.....	Rules 56-59
Class F: Marine wiring.....	Rules 60-72

560

Paper 826

REPORT OF COMMITTEE ON FLANGE STANDARDIZATION

Presented at New York, December 1899. Printed in *Trans. Am. Soc. M. E.*, Vol. 21 (1900), pp. 29 to 33. 1 fig., 1 table. (Supersedes Papers 481 and 504. Superseded by Paper 1430)

This report contains the schedule of standard flanges adopted by a committee of the Master Steam and Hot Water Fitters' Association, the American Society of Mechanical Engineers, and the leading valve and fitting manufacturers of the United States. This schedule is called the August 1894 schedule, and differs from the schedule in Report No. 504 in the 2 $\frac{1}{2}$ -in., 3 $\frac{1}{2}$ -in., 4-in., 9-in., and 12-in. sizes, the difference being in the flange diameters.

The report also contains a sample "Bates Flange Chart," prepared by Edward P. Bates, of the committee

Paper 827

REPORT OF COMMITTEE ON THE REVISION OF THE SOCIETY CODE OF 1885, RELATIVE TO A STANDARD METHOD OF CONDUCTING STEAM-BOILER TRIALS

Presented and discussed at New York, November 1899. Printed in *Trans. Am. Soc. M. E.*, Vol. 21 (1900), pp. 34 to 111. 8 figs., 41 appendices. (Superseded by Paper 1526)

(CODE OF 1899)

When the Committee of 1885 formulated its code, the only coals in question were the anthracite of the Lehigh Valley and other coals of Eastern Pennsylvania, and the Cumberland coal as bituminous coal. Revision of the code is due

largely to the fact that in its application in the Middle and Far West many difficulties were encountered and there was opposition to certain rulings. The revision is the result of the committee's effort to overcome this opposition. The amendments relate to the use of improved steam calorimeters, to sampling coal and determining its moisture, to calorific tests and analysis of coal, to analysis of flue gases, to smoke observations, to determinations of efficiency, and to methods of working out the heat balance.

Paper 828

DISCUSSION UPON THE PROVISIONAL AND AMENDED DRAFTS OF
THE REPORT OF THE COMMITTEE ON THE REVISION OF THE
CODE OF 1885, RELATIVE TO A STANDARD METHOD
FOR CONDUCTING STEAM-BOILER TRIALS

Presented at New York, December 1899. Printed in Trans. Am. Soc.
M. E., Vol. 21 (1900), pp. 112 to 138. (20 cents)

This discussion relates to the previous paper, No. 827.

Paper 887

REPORT OF COMMITTEE ON STANDARDIZATION OF ENGINES AND
DYNAMOS

Presented and discussed at Milwaukee, May 1901. Printed in Trans. Am.
Soc. M. E., Vol. 22 (1901), pp. 520 to 530. 1 fig., 1 table. (Superseded by
Paper 916)

561

The second report of this committee. The first report was a progress report, made at Cincinnati, May 1900, and printed in Trans. Am. Soc. M. E., Vol. 21 (1900), pp. 776 to 781, proposing standards for electric generators.

This report covers all the features of engines and dynamos to be standardized, with the exception of proportions of keys, and shrinkage allowance for armature fits. Its recommendations include:

- 1 Standard sizes of units
- 2 Corresponding r. p. m. for these units
- 3 Sizes of shaft for the two classes of center-crank and side-crank engines
- 4 Length along shaft required for generator
- 5 Height of axis of shaft over top of sub-base
- 6 Width of top of sub-base
- 7 Armature fit
- 8 Overload capacity of generators
- 9 Brush holders
- 10 Holding down bolts, keys and outboard bearings.

Paper 916

FINAL REPORT OF COMMITTEE ON STANDARDIZATION OF ENGINES
AND DYNAMOS

Presented and discussed at New York, December 1901. Printed in Trans.
Am. Soc. M. E., Vol. 23 (1902), pp. 99 to 110. 2 figs., 1 table. (See also
Paper 1056) (10 cents)

This report includes the features of Paper 887, together with recommendations of the points remaining to be standardized.

Paper 917

**REPORT OF THE COMMITTEE ON STANDARD PIPE UNIONS, PREPARED
IN JOINT CONFERENCE WITH SIMILAR COMMITTEES OF THE
AMERICAN RAILWAY MASTER MECHANICS' AS-
SOCIATION AND THE MASTER CAR
BUILDERS' ASSOCIATION**

Presented and discussed at New York, December 1901. Printed in Trans.
Am. Soc. M. E., Vol. 23 (1902), pp. 111 to 124. 17 figs., 1 table. (See also
Paper 948) (10 cents)

The committee undertook the complete design of commercial sizes of malleable pipe unions for wrought-iron pipe from $\frac{1}{8}$ in. to 4 in. inclusive. The mark "S" on the side of the nut was recommended as a designating mark, and this was copyrighted on the recommendation of the committee.

Paper 948

**SUPPLEMENTARY REPORT OF COMMITTEE ON STANDARD PIPE
UNIONS**

Presented and discussed at Boston, May 1902. Printed in Trans. Am.
Soc. M. E., Vol. 23 (1902), pp. 681 to 685. 4 figs. (See also Paper 917)
(10 cents)

Following the publication of Report No. 917, some slight criticisms of certain parts of the designs were received. These criticisms are answered in this supplementary report.

Paper 972

**REPORT OF COMMITTEE APPOINTED TO DISCUSS THE ARGUMENTS
IN FAVOR OF AND AGAINST THE METRIC SYSTEM**

Presented and discussed at New York, December 1902. Printed in Trans.
Am. Soc. M. E., Vol. 24 (1903), pp. 630 to 712. 21 appendices. (60 cents)

As a result of the report of the House Committee on Coinage, Weights and Measures, recommending the passage by Congress of the Metric-System Bill, a committee was appointed to present a report. The committee agreed upon the following points:

- 1 Legislation designed to compel the exclusive use of the metric system is not desirable
- 2 Such legislation could not be enforced in any event so far as transactions between private individuals are concerned
- 3 The general government has the power to specify the system to be used in its own work and business, and can require that work done for it by contractors shall conform to any specified measurements or weights
- 4 The government cannot compel any one to bid upon its specifications
- 5 Recognizing the well-settled fact that the consumer does and must pay all necessary costs of production, if the government specifies such dimensions as will materially increase costs of production, the government and not the bidder will have to pay such increased costs, it being self-evident that a bidder, not compelled to bid, will not bid except at a price which will afford him a profit
- 6 The bill now before Congress is intended to make the use of the metric system compulsory in the several departments of the government, but it cannot make it compulsory in private transactions

- 7 There is no force in that class of arguments which consists in taking integral dimensions in one system, translating them into equivalent and, therefore, fractional dimensions in the other system and then making comparisons. Such arguments can be made as strong for the one system as for the other.

In addition, members of the committee in favor of the metric system prepared a statement, and those against it prepared an answering argument, both of which are printed in the report.

Paper 973

FINAL REPORT OF COMMITTEE APPOINTED TO STANDARDIZE A SYSTEM OF TESTING STEAM ENGINES

Presented at New York, December 1902. Printed in Trans. Am. Soc. M. E., Vol. 24 (1903), pp. 713 to 790. 18 figs., 5 tables. (Superseded by Paper 1526)

(CODE OF 1902)

A proposed standard for testing in a scientific and practical way all the particular classes of engines, whatever the nature of their services, without conflicting with the recommendations of former committees of the Society relating to pumping-engine tests, locomotive tests and boiler tests.

The Committee recommends that the standard of consumption should be referred to heat units, that indicated and brake horsepower be used as units of mechanical power, and that for the purpose of comparing economies the number of heat units consumed per hour, both per indicated and per brake horsepower, be used.

The committee gave due attention to a report of the Institution of Civil Engineers on the Definition of a Standard or Standards of Thermal Efficiency for Steam Engines.¹

The committee chose as one of the important subsidiary forms of expressing efficiency that based on a so-called "standard coal" unit. The term "standard coal" refers to a coal which imparts to the steam 10,000 B.t.u. for each pound of dry coal consumed. (Calorific value, 12,500 B.t.u. per lb.)

The general recommendation in the report is, first, to satisfy the special object in view; that is, to lay down a form of test which shall serve as a standard for all steam engines, whatever their service, viz., the heat-unit test; second, to supplement the standard system thus framed with provisions for systematically determining other forms of expressing efficiency in steam engines; third, and as a further supplement, to standardize the methods of testing steam engines and results obtained with reference to their particular service, so far as this has not been heretofore accomplished; and fourth, to systematize the work of testing gas, oil and internal-combustion engines. The tables of data and results recommended are planned accordingly.

The rules for conducting steam-engine tests include:

- 1 Object of test
- 2 General condition of plant
- 3 Dimensions, etc.
- 4 Coal
- 5 Calibration of instruments
- 6 Leakages of steam, water, etc.
- 7 Duration of test
- 8 Starting and stopping a test
- 9 Measurement of heat units consumed by engine
- 10 Measurement of feedwater or steam consumption of engine, etc.

¹ Proc. Inst. C. E., 1898, and as embodied in the British Standard Analysis Code.

- 11 Measurement of steam used by auxiliaries
- 12 Coal measurement
- 13 Indicated horsepower
- 14 Testing indicator springs
- 15 Brake horsepower
- 16 Quality of steam
- 17 Speed
- 18 Recording the data
- 19 Uniformity of conditions
- 20 Analysis of indicator diagrams
- 21 Standards of economy and efficiency
- 22 Heat analysis
- 23 Temperature-entropy diagram
- 24 Ratio of economy of an engine to that of an ideal engine
- 25 Miscellaneous
- 26 Report of test.

Paper 974

**DISCUSSION OF PRELIMINARY FORMS OF REPORT OF COMMITTEE
ON STANDARDIZING ENGINE TESTS**

Presented at Milwaukee, May 1901, New York, December 1901, and
Boston, May 1902. Printed in Trans. Am. Soc. M. E., Vol. 24 (1903), pp.
791 to 846. (40 cents)

This includes the discussion of the first report of the committee at the New York Meeting, December 1902. In closing the discussion the committee states that the various criticisms and suggestions have been carefully weighed and that the report as it now stands embodies the final conclusions.

Paper 977

**564 REPORT ON MEETING OF NATIONAL CONFERENCE ON STANDARD
ELECTRIC LIGHTING RULES**

Presented at Saratoga, June 1903. Printed in Trans. Am. Soc. M. E.,
Vol. 24 (1903), pp. 885 to 888. (10 cents)

Amendments proposed by the A. S. M. E. delegate to the National Conference on Standard Electrical Rules, to the following National Electrical Code Rules:

- No. 12 Constant-potential pole lines over 5000 volts
- No. 13 Grounding low-potential circuits
- No. 64 Signalling systems.

Paper 978

REPORT OF SPECIAL COMMITTEE ON RULES AND METHODS

Presented at Saratoga, June 1903. Printed in Trans. Am. Soc. M. E.,
Vol. 24 (1903), pp. 891 to 920. (30 cents)

Second revised edition of the draft of the Constitution, By-Laws and Rules of the Society, with changes and amendments submitted by members and accepted by the committee previous to June 1, 1903.

Paper 979

**REPORT OF THE COMMITTEE ON SPECIFICATIONS FOR BOILER PLATE,
RIVET STEEL, STEEL CASTINGS AND STEEL FORGINGS**

Presented and discussed at Saratoga, 1903. Printed in Trans. Am. Soc.
M. E., Vol. 24 (1903), pp. 921 to 928. (Superseded by Paper 1469)

A tentative report based on the specifications prepared by the American Branch of Committee No. 1 of the International Association for Testing Materials. It was referred back for further action.

Paper 1026

REPORT OF COMMITTEE ON SPECIFICATIONS FOR BOILER PLATE,
RIVET STEEL, STEEL CASTINGS AND STEEL FORGINGS

Presented and discussed at New York, December 1903. Printed in Trans. Am. Soc. M. E., Vol. 25 (1904), pp. 321 to 354. 1 table. (Superseded by Paper 1469)

The American Society for Testing Materials was the outgrowth of the International Organization of which the A. S. M. E. was a member. Committee No. 1 of the American Society for Testing Materials prepared a series of specifications, and the present committee was appointed to consider them; and submitted a tentative report.

Paper 1034

APPENDIX IV TO SIXTH REPORT OF ALLOYS RESEARCH COMMITTEE,
BY DR. WILLIAM CAMPBELL

Presented at Chicago, June 1904. Printed in Trans. Am. Soc. M. E., Vol. 25 (1904), pp. 599 to 636. 109 photomicrographs. (30 cents)

This is a summary of various papers handed in by Sir William Roberts-Austen (October 1901), on the effects of strain and of annealing in aluminum, antimony, bismuth, cadmium, copper, lead, silver, tin and zinc.

Paper 1054

PRELIMINARY REPORT OF A COMMITTEE TO COÖPERATE IN STAND-
ARDIZING ABBREVIATIONS, SYMBOLS, PUNCTUATION, ETC.,
IN TECHNICAL PAPERS

565

Presented at New York, December 1904. Printed in Trans. Am. Soc. M. E., Vol. 26 (1905), pp. 60 to 63. (10 cents)

The committee consists of one member each of the American Society of Civil Engineers, The American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers.

The report gives fourteen rules, with a list of examples, which are recommended to the four societies for adoption.

Paper 1055

PRELIMINARY REPORT OF COMMITTEE APPOINTED TO SUGGEST A
STANDARD TONNAGE BASIS FOR REFRIGERATION

Presented at New York, December 1904. Printed in Trans. Am. Soc. M. E., Vol. 26 (1905), pp. 64 to 66. (10 cents)

The committee confined itself to a thermal rating and to the establishment of a set of conditions representing good average engineering practice. It considered the selection of units to measure the cooling effect or the refrigeration produced, and the selection of a standard set of conditions under which a refrigerating machine shall be run in determining its commercial tonnage capacity.

Paper 1056

APPENDIX TO REPORT OF COMMITTEE ON STANDARDIZATION OF
ENGINES AND DYNAMOS

Presented at New York, December 1904. Printed in Trans. Am. Soc. M. E., Vol. 26 (1905), p. 67. (10 cents)

Recommends that "to facilitate pressing the armature upon the engine shaft,

the engine builder should reduce the diameter of the shaft beyond the armature fit an amount not less than six thousandths of an inch."

Paper 1109

**REPORT OF COMMITTEE APPOINTED TO COÖPERATE WITH THE
PENNSYLVANIA RAILROAD SYSTEM IN CONDUCTING TESTS
OF LOCOMOTIVES AT THE LOUISIANA PURCHASE
EXPOSITION**

Presented and discussed at Chattanooga, May 1906. Printed in Trans. Am. Soc. M. E., Vol. 27 (1906), pp. 610 to 641, with appendix. 8 tables. (20 cents)

The appendix is a brief abstract from "Locomotive Tests and Exhibits, Pennsylvania Railroad System, Louisiana Purchase Exposition" published by the Pennsylvania Railroad, setting forth the results of the tests.

Paper 1142

**REVISED REPORT OF COMMITTEE ON STANDARD PROPORTIONS FOR
MACHINE SCREWS**

Presented at Indianapolis, May 1907. Printed in Trans. Am. Soc. M. E., Vol. 29 (1907), pp. 99 to 122. 1 insert 14 tables. (20 cents)

The committee's first report was presented at New York, December 1905, and after discussion and amendments again at Chattanooga, and New York (1906). It was accepted at Indianapolis by a unanimous vote of the Society. The report also includes a statement as to the "Automobile Association Standard Bolts and Nuts."

566

Paper 1142A

**CONDENSED TABULATION OF REPORT OF COMMITTEE ON STANDARD
PROPORTIONS FOR MACHINE SCREWS**

Presented at Indianapolis, May 1907. Printed in Trans. Am. Soc. M. E., Vol. 29 (1907), pp. 99 to 122. (10 cents)

This is issued on the authority of the committee and contains tables for standard and special screws, standard and special taps, heads and templet gages. One of these tables, reproduced on p. 567 as Table 1, gives dimensions of standard screws. All dimensions in decimal parts of an inch.

Paper 1305

**REPORT OF COMMITTEE ON IDENTIFICATION OF POWER-HOUSE
PIPING**

Printed in Trans. Am. Soc. M. E., Vol. 33 (1911), p. 17. (10 cents)

The committee recommends distinguishing colors for pipe lines, to be applied to valves, flanges and fittings only.

Paper 1367

**REPORT OF SUB-COMMITTEE ON MACHINE SHOP PRACTICE ON
DEVELOPMENTS IN MACHINE SHOP PRACTICE DURING THE
LAST DECADE**

Presented at New York, December 1912. Printed in Trans. Am. Soc. M. E., Vol. 34 (1912), pp. 847 to 865. (20 cents)

The principal improvements during the last ten years are reviewed under such

headings as increased weight of machines, foundations, electric drive, automatic machines, training mechanics, scientific management, standardization of grinding tools, checking systems for small tools, drilling machines, lathes, milling machines, gear making, small tools, etc.

Paper 1378

MAJORITY REPORT OF SUB-COMMITTEE ON ADMINISTRATION ON THE PRESENT STATE OF THE ART OF INDUSTRIAL MANAGEMENT

Presented and discussed at New York, December 1912. Printed in Trans. Am. Soc. M. E., Vol. 34 (1912), pp. 1131 to 1229. 3 appendices and minority report. (70 cents)

The committee reviews the conditions leading up to the recent changes. It obtained information from recognized experts and submits a summary statement of this under such headings as labor-saving management, regulative principles of industrial management, the practice of management, statistical data, etc.

TABLE 1 STANDARD SCREWS

Old No.	NEW Outside diam. and threads per inch	OUTSIDE DIAMETERS			PITCH DIAMETERS			ROOT DIAMETERS			THICKNESS OF TEMPLET GAGERS
		Minimum	Maximum	Difference	Minimum	Maximum	Difference	Minimum	Maximum	Difference	
0	.060-80	.0572	.060	.0028	.0505	.0519	.0014	.0410	.0438	.0028	.161
1	.073-72	.0700	.073	.0030	.0625	.0640	.0015	.0520	.0550	.0030	.166
2	.086-64	.0828	.086	.0032	.0743	.0759	.0016	.0624	.0657	.0033	.172
3	.099-56	.0955	.099	.0035	.0857	.0874	.0017	.0721	.0758	.0037	.180
4	.112-48	.1082	.112	.0038	.0966	.0985	.0019	.0807	.0849	.0042	.192
5	.125-44	.1210	.125	.0040	.1082	.1102	.0020	.0910	.0955	.0045	.199
6	.138-40	.1338	.138	.0042	.1197	.1218	.0021	.1007	.1055	.0048	.208
7	.151-36	.1466	.151	.0044	.1308	.1330	.0022	.1097	.1149	.0052	.218
8	.164-36	.1596	.164	.0044	.1438	.1460	.0022	.1227	.1279	.0052	.218
9	.177-32	.1723	.177	.0047	.1544	.1567	.0023	.1307	.1364	.0057	.231
10	.190-30	.1852	.190	.0048	.1660	.1684	.0024	.1407	.1467	.0060	.239
12	.216-28	.2111	.216	.0049	.1904	.1928	.0024	.1633	.1696	.0063	.249
14	.242-24	.2368	.242	.0052	.2123	.2149	.0026	.1808	.1879	.0071	.271
16	.268-22	.2626	.268	.0054	.2358	.2385	.0027	.2014	.2090	.0076	.285
18	.294-20	.2884	.294	.0056	.2587	.2615	.0028	.2208	.2290	.0082	.303
20	.320-20	.3144	.320	.0056	.2847	.2875	.0028	.2468	.2550	.0082	.303
22	.346-18	.3402	.346	.0058	.3070	.3099	.0029	.2649	.2738	.0089	.324
24	.372-16	.3660	.372	.0060	.3284	.3314	.0030	.2810	.2908	.0098	.350
26	.398-16	.3920	.398	.0060	.3544	.3574	.0030	.3070	.3168	.0098	.350
28	.424-14	.4178	.424	.0062	.3745	.3776	.0031	.3204	.3312	.0108	.384
30	.450-14	.4438	.450	.0062	.4005	.4036	.0031	.3464	.3572	.0108	.384

Paper 1394

REPORT OF COMMITTEE ON STANDARDIZATION OF CATALOGUES ON STANDARD SIZES OF CATALOGUES

Presented at Baltimore, 1913. Printed in Trans. Am. Soc. M. E., Vol. 35 (1913), pp. 269 to 274. (10 cents)

The committee recommends standard sizes for index cards, folders, catalogues, paper boxes, filing boxes and cabinets.

Paper 1398

REPORT OF SUB-COMMITTEE ON FIRE PROTECTION ON STANDARD
THREADS FOR HOSE COUPLINGS

Presented at New York, December 1913. Printed in Trans. Am. Soc.
M. E., Vol. 35 (1913), pp. 301 to 307. (10 cents)

(NATIONAL STANDARD)

The committee has formulated specifications for $2\frac{1}{2}$ -, 3-, $3\frac{1}{2}$ - and 4-in. hose couplings, and for converting non-standard couplings.

Paper 1399

REPORT OF COMMITTEE ON STANDARDIZATION OF PIPE-THREAD
GAGES

Presented at New York, December 1913. Printed in Trans. Am. Soc.
M. E., Vol. 35 (1913), pp. 309 to 311. 1 table. (10 cents)

The purpose of the committee was to fix manufacturing limits for the use of the Briggs standard pipe-thread gages when tapping fittings or flanges, so that pipe cut to the Briggs standard might always enter a definite number of turns. A table of sizes and tolerances is given.

Paper 1403

REPORT OF SUB-COMMITTEE ON HOISTING AND CONVEYING

Presented and discussed at New York, December 1913. Printed in Trans.
Am. Soc. M. E., Vol. 35 (1913), pp. 405 to 416. (10 cents)

568

The committee reviews developments in hoisting and conveying, and makes preliminary recommendations as to boilers, electric equipment, safety, foundations, depreciation, wheels, brakes, wire rope, ethics.

Paper 1429

REPORT OF COMMITTEE ON CODE OF ETHICS

Recommended by letter ballot of the membership of the Society. Reported at St. Paul, Minneapolis, June 1914. Printed in Trans. Am. Soc.
M. E., Vol. 36 (1914), pp. 23 to 27. (10 cents)

The committee's recommendations deal with general principles, engineers' relations to client or employer, ownership of engineering records and data, engineers' relations to the public and to the engineering fraternity.

Paper 1430

REPORT OF COMMITTEE ON STANDARDIZATION OF FLANGES ON THE
AMERICAN STANDARD FOR PIPE FLANGES, FITTINGS AND
THEIR BOLTING

*Including Schedule of Standard Pipe Flanges and Fittings from 1
In. to 100 In., 125 Lb. Working Pressure, and Schedule
of Extra Heavy Pipe Flanges and Fittings from
1 In. to 48 In., 250 Lb. Working Pressure*

Presented at New York, December 1913, and subsequently revised.
Printed in Trans. Am. Soc. M. E., Vol. 36 (1914), pp. 29 to 57. 4 tables,
32 figs. Recommended to become effective January 1, 1914, and revised to
March 7 and 20, 1914. (40 cents)

The American Standard is a compromise between the 1912 U. S. Standard and the Manufacturers' Standard adopted in 1912, and combines the advantages

of both. The standard-weight or low-pressure sizes have been extended from 30 in. to 100 in., and the extra heavy or high-pressure sizes from 24 in. to 48 in.

Paper 1448

REPORT OF SUB-COMMITTEE ON RAILROADS ON STEAM LOCOMOTIVES OF TODAY

Presented and discussed at New York, December 1914. Printed in Trans. Am. Soc. M. E., Vol. 36 (1914), pp. 483 to 534. (40 cents)

This report and discussion is devoted to the progress of the steam locomotive, especially during the ten years since the Louisiana Purchase Exposition tests reported in Paper 1109.

Paper 1450

REPORT OF THE COMMITTEE ON RESOLUTIONS OF THE SNOW REMOVAL CONFERENCE HELD IN PHILADELPHIA, APRIL 16 AND 17, 1914

Presented and discussed at New York, December 1914. Printed in Trans. Am. Soc. M. E., Vol. 36 (1914), pp. 551 to 569

The committee reviews the methods adopted for the removal of snow, deals with the particular cases of Philadelphia, New York, Boston, Scranton, the Public Service Railway Company of New Jersey and the Pennsylvania Railroad Company, and in conclusion makes eight recommendations on the subject.

Paper 1468

REPORT OF COMMITTEE ON STANDARD CROSS-SECTIONS AND SYMBOLS

Presented and discussed at New York, December 1914. Printed in Trans. Am. Soc. M. E., Vol. 36 (1914), pp. 965 to 976. 2 figs. (10 cents)

The committee recommends a standard method of indicating materials in cross-section and submits cross-sections for 19 materials. Fig. 1 shows the recommended forms of cross-hatching.

569

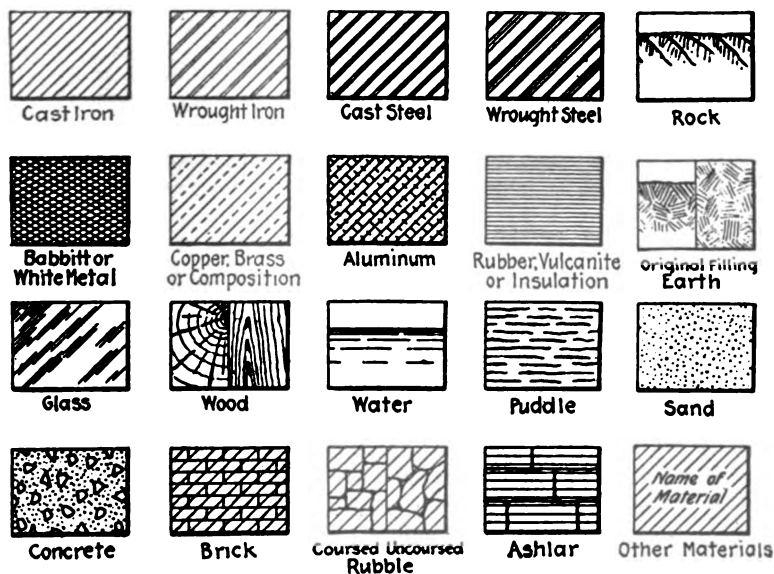


FIG. 1 RECOMMENDED FORMS OF CROSS-HATCHING

Paper 1469

**REPORT OF COMMITTEE¹ TO FORMULATE STANDARD SPECIFICATIONS
FOR THE CONSTRUCTION OF STEAM BOILERS AND OTHER
PRESSURE VESSELS AND FOR THEIR CARE IN SERVICE**

Presented at New York, December 1914. Approved by the Council Feb. 13, 1915. Printed in *Trans. Am. Soc. M. E.*, Vol. 36 (1914), pp. 977 to 1088. 16 tables, 30 figs. and 4 indexes. (80 cents paper, \$1.60 cloth)

The committee was appointed on September 15, 1911, and submits its final report, the primary object of which is to secure safe boilers. When the report was accepted, the Boiler Code Committee was reappointed as a permanent committee and now meets monthly for the purpose of considering communications relative to the Boiler Code. The results are published in *THE JOURNAL* each month. The following is a résumé of the contents of the Boiler Code:

- New Installations
 - Power Boilers
 - Specifications for Boiler Plate Steel, Boiler Rivet Steel, Staybolt Steel, Steel Castings, Gray Iron Castings, Malleable Castings, Boiler Rivet Iron, Staybolt Iron, Refined Wrought-Iron Bars, Boiler Tubes
 - Heating Boilers
- Existing Installations
- Appendix
 - Efficiency of Joints, Braced and Stayed Surfaces, Safety Valves, Fusible Plugs.

570

Paper 1474

**REPORT OF COMMITTEE ON STANDARDIZATION OF SPECIAL THREADS
FOR FIXTURES AND FITTINGS, ON ROLLED THREADS FOR
SCREW SHELLS OF ELECTRIC SOCKETS AND LAMP
BASES**

Presented at Buffalo, N. Y., June 1915. Printed in *Trans. Am. Soc. M. E.*, Vol. 37 (1915), pp. 25 to 29. 4 figs. (See also Paper 1525) (10 cents)

The report gives standard dimensions of socket screw shells and lamp-base screw shells for miniature, candelabra, medium and mogul sizes, go and not-go.

Paper 1523

**REPORT OF SUB-COMMITTEE ON MACHINE SHOP PRACTICE ON
SAFETY CODE FOR THE USE AND CARE OF ABRASIVE WHEELS**

Presented and discussed at New York, December 1915. Printed in *Trans. Am. Soc. M. E.*, Vol. 37 (1915), pp. 1221 to 1230. 4 tables. (10 cents)

In nearly all vital points a code recommended by the Abrasive Wheel Manufacturers was approved, and forms the basis of the present code. The safety devices are considered under the three general heads: protection flanges, protection hoods and protection chucks.

Table 2, giving revolutions per minute for various sizes of grinding wheels to give the peripheral speed in feet per minute, is included in this report.

¹ The Boiler Code Committee.

A. S. M. E. STANDARDS

TABLE 2 R. P. M. FOR VARIOUS SIZES OF GRINDING WHEELS TO GIVE PERIPHERAL SPEED IN FT. PER MIN.

Diam. of Wheel in In.	4,000	4,500	5,000	5,500	6,000	6,500
1	15,279	17,200	19,099	21,000	22,918	24,850
2	7,639	8,590	9,549	10,500	11,459	12,420
3	5,093	5,725	6,366	7,000	7,639	8,270
4	3,820	4,295	4,775	5,250	5,730	6,205
5	3,056	3,440	3,820	4,200	4,584	4,970
6	2,546	2,865	3,183	3,500	3,820	4,140
7	2,183	2,455	2,728	3,000	3,274	3,550
8	1,910	2,150	2,387	2,635	2,865	3,100
10	1,528	1,720	1,910	2,100	2,292	2,485
12	1,273	1,453	1,592	1,750	1,910	2,070
14	1,091	1,228	1,364	1,500	1,637	1,773
16	955	1,075	1,194	1,314	1,432	1,552
18	849	1,061	1,061	1,167	1,273	1,380
20	764	860	957	1,050	1,146	1,241
22	694	782	868	952	1,042	1,128
24	637	716	796	876	955	1,035
26	586	661	733	809	879	955
28	546	614	683	749	819	887
30	509	573	637	700	764	827
32	477	537	596	657	716	776
34	449	506	561	618	674	730
36	424	477	531	584	637	689
38	402	453	503	553	603	653
40	382	430	478	525	573	621
42	364	409	455	500	546	591
44	347	391	434	477	521	564
46	332	374	415	456	498	539
48	318	358	397	438	477	517
50	306	344	383	420	459	497
52	294	331	369	404	441	487
54	283	318	354	389	425	459
56	273	307	341	366	410	443
58	264	296	330	354	396	428
60	255	277	319	350	383	414

571

Paper 1525

REPORT OF COMMITTEE ON STANDARDIZATION OF SPECIAL THREADS FOR FIXTURES AND FITTINGS, ON STRAIGHT PIPE THREADS

Presented at New York, December 1915. Printed in Trans. Am. Soc. M. E., Vol. 37 (1915), pp. 1263 to 1272. 5 tables, 3 figs. (See also Paper 1474) (10 cents)

This report recommends standards for outside, pitch, and root diameters and tolerances of straight pipe threads. The proportions recommended are shown in Fig. 2 and in Table 3.

Paper 1526

REPORT OF POWER TEST COMMITTEE ON RULES FOR CONDUCTING PERFORMANCE TEST OF POWER PLANT APPARATUS

Presented at New York, December 1915. Printed in Trans. Am. Soc. M. E., Vol. 37 (1915), pp. 1273 to 1458. 22 tables, 27 figs., 38 appendices. Index. (Supersedes all previous codes for testing power-plant apparatus) (\$1.40 paper, \$2.00 cloth)

(POWER TEST CODE)

The following is a résumé of the contents of the Power Test Code:

General Matters

- 1 Instructions regarding tests, object, preparations, miscellaneous instructions, operating conditions, records, plotting data and curves, report

TABLE 3 AMERICAN BRIGGS PIPE STANDARD LOCK-NUT THREADS AND BASIC STRAIGHT PIPE SIZES

Pipe Size In.	Threads per In.	Depth Thread	Pitch Diameter End of Pipe	Pitch Diameter at Notch Basic Straight	Maximum Pitch Diameter Male Lock-nut Thread	Minimum Pitch Diameter Outside Lock-nut Thread	Outside Diameter Pipe	Thickness Full Briggs Ring	Inches Thickness American Briggs Ring	Pitch Diameter at Large End	Difference in Diameter One Thread
	n	0.8 n	A	B	C_1	C_2	D	E	F	G	H
$\frac{1}{8}$	27	0.02962	0.36350	0.37475	0.38400	0.38632	0.405	0.2638	0.180	0.37999	0.00232
$\frac{3}{16}$	18	0.04444	0.47739	0.48989	0.50378	0.50725	0.540	0.4018	0.200	0.50250	0.00347
$\frac{1}{4}$	18	0.04444	0.61201	0.62701	0.64090	0.64437	0.675	0.4078	0.240	0.63750	0.00347
$\frac{5}{16}$	14	0.05714	0.75643	0.77843	0.79628	0.80075	0.840	0.537	0.320	0.79179	0.00446
$\frac{3}{8}$	14	0.05714	0.96768	0.98886	1.00671	1.01118	1.050	0.5457	0.339	1.00179	0.00446
1	$11\frac{1}{2}$	0.06956	1.21363	1.23863	1.26036	1.26580	1.315	0.6828	0.400	1.25630	0.00543
$1\frac{1}{4}$	$11\frac{1}{2}$	0.06956	1.5713	1.58338	1.60511	1.61055	1.660	0.7068	0.420	1.60132	0.00543
$1\frac{1}{2}$	$11\frac{1}{2}$	0.06956	1.79609	1.82234	1.84407	1.84951	1.900	0.7235	0.420	1.84131	0.00543
2	$11\frac{1}{2}$	0.06956	2.26902	2.29627	2.31801	2.32344	2.375	0.7356	0.436	2.31630	0.00543
$2\frac{1}{2}$	8	0.10000	2.71954	2.76216	2.79341	2.80122	2.875	1.1375	0.682	2.79063	0.00781
3	8	0.10000	3.34063	3.38850	3.41975	3.42756	3.500	1.2000	0.766	3.41563	0.00781
$3\frac{1}{4}$	8	0.10000	3.83750	3.88561	3.92008	3.92787	4.000	1.2500	0.821	3.91563	0.00781
4	8	0.10000	4.33438	4.38713	4.41598	4.42019	4.500	1.3000	0.844	4.41563	0.00781
$4\frac{1}{4}$	8	0.10000	5.33125	5.38593	5.41598	5.42499	5.500	1.3500	0.875	5.41563	0.00781
5	8	0.10000	5.82812	5.88597	5.91598	5.92499	6.000	1.4000	0.937	5.91563	0.00781
6	8	0.10000	6.82500	6.88597	6.91598	6.92499	7.000	1.4500	0.968	6.91563	0.00781
7	8	0.10000	7.82188	7.88597	7.91598	7.92499	8.000	1.5000	1.000	7.91563	0.00781
8	8	0.10000	8.81875	8.88597	8.91598	8.92499	9.000	1.5500	1.030	8.91563	0.00781
9	8	0.10000	9.81563	9.88597	9.91598	9.92499	10.000	1.6000	1.060	9.91563	0.00781
10	8	0.10000	10.81250	10.88597	10.91598	10.92499	11.000	1.6500	1.090	10.91563	0.00781

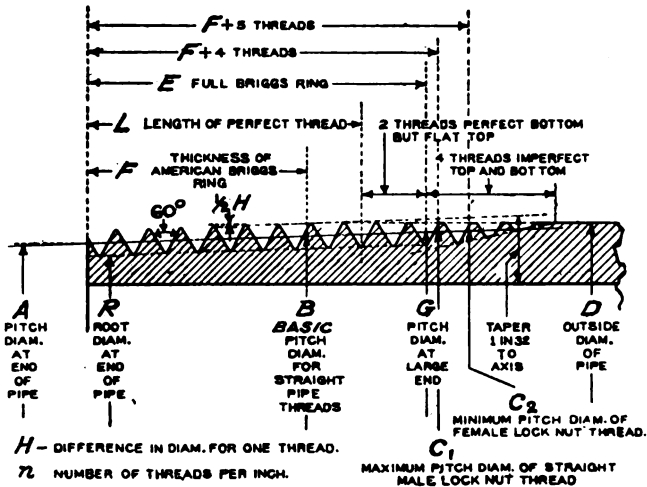


FIG. 2 BASIC STRAIGHT PIPE SIZES

- 2 Standards relating to capacity, efficiency and economy
- 3 Rules for sampling and drying coal and ash, and sampling steam and gases

Individual Codes

- 4 Boiler code
 - 5 Reciprocating steam engine code
 - 6 Steam turbine code
 - 7 Pumping machinery code
 - 8 Code for compressors, blowers, fans
 - 9 Code for complex steam power plant
 - 10 Locomotive codes
 - 11 Gas producer code
 - 12 Gas and oil engine code
 - 13 Waterwheel code
- Appendices.

573

Paper 1572

REPORT OF SUB-COMMITTEE ON PROTECTION OF INDUSTRIAL WORKERS, ON CODE OF SAFETY STANDARDS FOR CRANES

Presented at New York, December 1916. Printed in Trans. Am. Soc. M. E., Vol. 38 (1916), pp. 1205 to 1212. 1 fig. (10 cents)

The standards in this report apply to cranes which are regularly used in and form part of a permanent industrial plant. In addition to electric traveling cranes, the regulations cover gib cranes, monorail cranes, hand-power cranes, and other hoisting apparatus of a similar nature, insofar as the various sections apply.

The report contains twenty recommendations on general construction, twenty-two rules for operators, six rules for floor men and six rules for repairmen. It also includes an illustrated code of manual signals for crane operation.

**DATA SECTION
PART II**

Engineering Data

575

Pages 577-588

On the following pages are engineering data selected from the TRANSACTIONS, Volume 39, 1917, and from THE JOURNAL of the American Society of Mechanical Engineers for the year 1917.

The material from the TRANSACTIONS includes original data derived by the authors of papers presented to the Society and embodied in those papers.

The data from THE JOURNAL are taken from the Engineering Survey Section, which includes abstracts from domestic and foreign periodicals and society publications, and the source of information is given in each instance.

INDEX TO ENGINEERING DATA

	PAGE
Ammonia, Latent Heat of	586
Automobiles, Retardation of	578
Combined Stresses, Formulæ for	582
Combustion, Smokeless	584
Cooling of Water for Power-Plant Purposes	585
Flow of Water in Wood-Stave Pipe	581
Gas Engine, Relation of Port Area to Power in	584
Measurement by Standard Orifice	581
Natural, Flow through Standard Orifice	581
Gases, Spark Lengths in Various	588
Heat Conduction through Air Surfaces and Glass	586
-Insulating Value of Roofing Material	580
Transfer between a Flowing Gas and a Containing Flue	583
Iron and Steel, Resistance to Stress Reversals	580
Wrought, Influence of High Temperature on Strength of	578
Moisture Content of Textiles and Some of Its Effects	587
Orifice Measurement of Gases, Standard	581
Pipes, Friction of Water Flowing in	582
Power Plants, Cooling Water in	585
Retardation of Automobiles	578
Roofing Material, Heat-Insulating Value of	580
Smokeless Combustion	584
Spark Lengths of Various Gases and Vapors	588
Steel and Iron, Resistance to Stress Reversals	580
Stresses, Combined, Formulæ for	582
Surface Resistance with Glass as Transmission Medium	586
Textiles, Moisture Content of	587
Water, Cooling of, for Power-Plant Purposes	585
Flow through Wood-Stave Pipe	581
Friction in Iron Pipes and Elbows	582
Wrought Iron, Influence of High Temperature on Strength of	578

RETARDATION OF AUTOMOBILES

The automobile death rate increases in inverse proportion to the efficiency of the retardation curve. Retardation relative to the road is a function of the coefficient of adhesion of the tire. The data given in Table 1 for stopping time and stopping distance of cars going at various speeds were computed from the value for possible retardation derived by taking $0.5 W/2$ as the retarding force, or a maximum retardation of about 8 ft. per sec. per sec.

TABLE 1 STOPPING TIMES AND DISTANCES OF CARS GOING AT VARIOUS SPEEDS UNDER COMPLETE BRAKING

	Stopping time Sec.	Stopping distance Ft.
A car going 60 m. p. h.....	11	484
A car going 30 m. p. h.....	$5\frac{1}{2}$	121
A car going 15 m. p. h.....	$2\frac{1}{4}$	$30\frac{1}{4}$
A car going 5 m. p. h.....	0.625	$4\frac{1}{2}$

[Journal, January 1917, p. 81]

[Source: *The Automobile*, November 30, 1916, p. 929]

THE INFLUENCE OF HIGH TEMPERATURE UPON THE ELASTIC AND TENSILE PROPERTIES OF WROUGHT IRON

The following conclusions were obtained from a series of experimental tests, the results of which are shown in Figs. 1, 2 and 3.

578

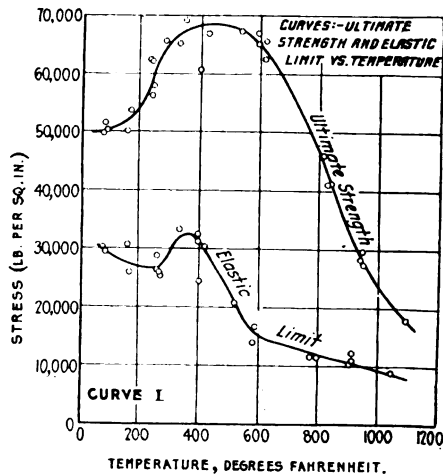


FIG. 1 CURVES OF ULTIMATE STRENGTH AND ELASTIC LIMIT VERSUS TEMPERATURE FOR WROUGHT IRON

The physical properties of wrought iron are materially affected by high temperature.

The ultimate tensile strength increases as the temperature increases from 70 deg. fahr. until a maximum is reached between 350 deg. and 550 deg. fahr.

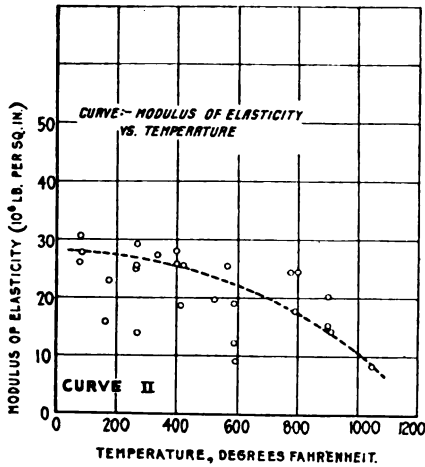


FIG. 2 CURVE OF MODULUS OF ELASTICITY VERSUS TEMPERATURE FOR WROUGHT IRON

Tenacity diminishes rapidly with increase of temperature.

The elastic limit appears to decrease from 70 deg. Fahr. to about 270 deg. Fahr., showing a maximum decrease of about 13 per cent. From that temperature the elastic limit appears to increase suddenly to about 350 deg. and then gradually drops.

579

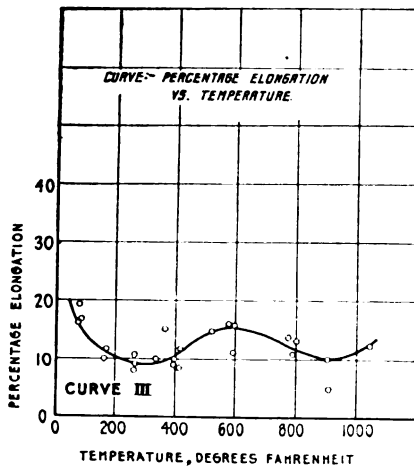


FIG. 3 CURVE OF PERCENTAGE ELONGATION VERSUS TEMPERATURE FOR WROUGHT IRON

The curve of elongation versus temperature is irregular.

For iron intended to be used at high temperatures a different factor of safety should be adopted than the one for iron used at low temperatures.

[*Journal*, September 1917, pp. 801 and 802]

[Source: *Metallurgical and Chemical Engineering*, July 15, pp. 67-71]

THE RESISTANCE OF IRON AND STEEL TO COMPLETE REVERSALS OF STRESS

Table 2 shows the results obtained from a series of slow-reversal and rotating-beam tests performed on steel bars.

TABLE 2 RESISTANCE OF STEEL TO COMPLETE REVERSALS OF STRESS

Material	Primitive limit	Yield point	Tensile strength	Range of Stress		
				Static	Rotating beams	Direct
Steel Forging (the writer; former experiments).....	12.50	14.0	28.56	18.4	24.4	...
Steel Forging (Stanton & Bairstow).....	12.94	14.52	29.47	...	...	20.60
Steel Forging (present experiments).....	10.0	14.0	25.4	21.5	39.2	22.0
Cast Steel (writer).....	22.24	...	55.70	40.50	44.8	...

[*Journal*, January 1917, p. 82]

[Source: *Engineering Review*, October 16, 1916, p. 120]

THE HEAT-INSULATING VALUE OF ROOFING MATERIAL

In a report of the National Physical Laboratory an account of a test of roofing by means of measuring the heat lost from a heated room led to the remarkable conclusion that the rate of emission of heat by the radiation from the covering surface has more effect on the inside temperature than the rate of conduction of heat through the material. In Table 3 the test of the National Physical Laboratory was repeated by a method the reverse of that used by them; namely, instead of heating a room and measuring the heat lost through the roof, a smaller chamber was made by bolting together slabs of 3-in. thick "nonpareil" cork and exposing its cover to strong radiation. The test consisted in observing the rate of rise of temperature in the chamber from the time the radiation was applied.

TABLE 3 HEAT TRANSMITTED THROUGH ROOFING MATERIAL EXPOSED TO STRONG RADIATION

Material		Rise of temperature in testing chamber, deg. cent. per min.	B.t.u. per 100 sq. ft. per hour	Thickness in inches	Weight lb., per sq. ft.
1	Bright galvanized-iron sheet.....	0.268	111	0.04	1.6
2	Galvanized iron, blackened below.....	0.40	168	0.04	1.6
3	Galvanized iron, blackened above.....	0.93	385	0.04	1.6
4	Galvanized iron, blackened above and below.....	1.40	581	0.04	1.6
5	Galvanized corrugated iron after one month's exposure to the weather.....	0.75	310	0.033	1.28
6	Do., after one year's exposure.....	1.02	422	0.033	1.28
7	No. 6, painted black above.....	1.13	472	0.033	1.28
8	Roofing glass, serrated.....	1.10	453	0.22	2.25
9	Welsh slate.....	0.81	337	0.17	2.0
10	Westmoreland slate.....	0.60	248	0.25	4.8
11	3/8-in. T. G. deal covered with asphalted felt.....	0.30	124	1.0	2.6
12	Corrugated fibrocement after one month in use.....	0.78	325	0.2	1.8
13	Do., after one year in use.....	0.80	334	0.2	1.8
14	Do., painted dead black.....	0.82	341	0.2	1.8
15	Do., "aluminum-finished" outside.....	0.50	207	0.2	1.8
16	Do., laid on top of thin asphalted felt.....	0.51	211	0.25	2.0

[*Journal*, December 1917, p. 1036]

[Source: *Engineering*, October 19, 1917, p. 405]

MEASURING GASES BY A STANDARD ORIFICE

The weight W of a gas discharged through an orifice in pounds per second is given by

$$W = \frac{AP_1K}{\sqrt{T_1}}$$

where A = area of orifice in square inches; P_1 = pressure just ahead of the orifice.

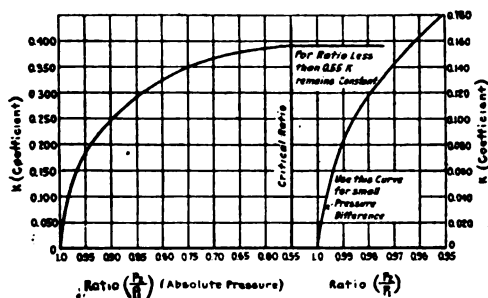


FIG. 4 CURVE OF K (COEFFICIENT) FOR FLOW OF NATURAL GAS THROUGH STANDARD ORIFICES

pounds per second absolute; K = coefficient from curve for flow of air through standard orifice, Fig. 4; and T_1 = initial temperature of gas, degrees fahrenheit absolute.

[*Journal*, March 1917, p. 256]

[Source: *Blast Furnace and Steel Plant*, January 1917, p. 16]

THE FLOW OF WATER IN WOOD-STAVE PIPE

The following formulæ based on experiments described in engineering literature have been supplemented by an extensive set of experiments:

$$H = \frac{7.68 V^{1.8}}{d^{1.17}} = \frac{0.419 V^{1.8}}{D^{1.17}} \quad [1]$$

$$V = 1.62 D^{0.65} H^{0.565} \quad [2]$$

$$Q = 1.272 D^{2.45} H^{0.565} \quad [3]$$

where H is the head of elevation lost in overcoming internal resistances within a fairly straight pipe of uniform size per 1000 linear feet of pipe; V the mean velocity of the water during test in feet per second; D the mean inside diameter of the pipe in feet; d the mean inside diameter of the pipe in inches; and Q the mean discharge of the pipe during the test in second-feet.

This new formula is the best now available for use in the design of wood-stave pipes, as its application meets (within one per cent) the mean of all observations and the mean capacity of all wood pipes upon which experiments have been made. If silted waters are to be conveyed, the pipe should be designed for a working velocity of from five to ten feet per second. If sand is present in the

water, the design should be for a velocity of about five feet per second, which will be high enough to carry out a large part of the sand and at the same time not so high as to seriously erode the pipe.

Wood pipe will convey about 15 per cent more water than a 10-year-old cast-iron pipe or a new riveted pipe, and about 25 per cent more than a cast-iron 20 years old or a riveted pipe 10 years old.

[*Journal*, January 1917, p. 171]

[Source: *United States Department of Agriculture, Bulletin No. 376*]

THE FRICTION OF WATER IN IRON PIPES AND ELBOWS

Data and experiments carried out by the Division of Engineering, Bureau of Economic Geology and Technology of the University of Texas, led to the establishment of the formula

$$h = 0.00685 \frac{v^{1.77}}{d^{1.276}}$$

showing the relation between the friction of flow of water (h) and the velocity (v) for clean iron pipes ranging in size from $\frac{1}{8}$ to 3 in. when the water has a temperature of about 68 deg. fahr. and flows at velocities up to 3 ft. per sec.

The friction of water at temperature of about 68 deg. fahr. in one standard short-radius steam elbow is given by

$$h = 0.0141 \frac{v^{1.96}}{d^{0.26}}$$

582

[*Journal*, September 1917, p. 805]

[Source: *Journal of the American Society of Heating and Ventilating Engineers*, July 1917, pp. 587-594]

COMBINED STRESSES

The equivalent tensile, compressive, and shearing stresses (T_e , C_e , and S_e) developed in a machine element subjected to combined loads may be found from:

$$T_e = \frac{(1-y)}{2} T + \frac{(1+y)}{2} \sqrt{4S^2 + T^2} \dots \dots \dots [1]$$

$$T_e = \frac{(1-y)}{2} C - \frac{(1+y)}{2} \sqrt{4S^2 + C^2} \dots \dots \dots [2]$$

$$C_e = \frac{(1-y)}{2} C + \frac{(1+y)}{2} \sqrt{4S^2 + C^2} \dots \dots \dots [3]$$

$$C_e = \frac{(1-y)}{2} T - \frac{(1+y)}{2} \sqrt{4S^2 + T^2} \dots \dots \dots [4]$$

$$S_e = \frac{(1+y)}{2} \sqrt{4S^2 + T^2} \dots \dots \dots [5]$$

$$S_e = \frac{(1+y)}{2} \sqrt{4S^2 + C^2} \dots \dots \dots [6]$$

where T = normal tensile unit stress
 C = " compressive " "
 S = " shearing " "
 γ = Poisson's ratio of lateral contraction.

If the ratio of the unit tensile stress at yield point divided by the unit shearing stress at yield point is called r , then the tensile-stress formulæ should be used when r is less, and the shear formulæ should be used when r is greater, than

$$\frac{(1 - \gamma) T}{(1 + \gamma) \sqrt{4S^2 + T^2}} + 1$$

If the material in torsion fails with a helical-shaped fracture, the equivalent-normal-stress formula should be used, and if it fails in a plane perpendicular to the axis, the equivalent-shear-stress formula should be used.

If a material fails in tension with a decided cup-shaped fracture, the equivalent-shear-stress formula should be used; whereas failure perpendicular to the axis of the tension specimen indicates that the equivalent-normal-stress formula is preferable.

[*A. Lewis Jenkins. Trans., vol. 39, p. 945*]

THE TRANSFER OF HEAT BETWEEN A FLOWING GAS AND A CONTAINING FLUE

If a gas flow x ft. through a flue of which the mean wall temperature is t , the change in temperature of gas from T_1 to T_2 is given by the expression

$$\text{lolog } T_1/t - \text{lolog } T_2/t = Mx \dots \dots \dots [1]$$

when the gas is hotter than the flue, or by the expression

$$\text{lolog } t/T_1 - \text{lolog } t/T_2 = Mx \dots \dots \dots [2]$$

when the flue is hotter than the gas. In either case "lolog" means "the logarithm of the logarithm." The three temperatures T_1 , T_2 and t are to be measured from the absolute zero in any scale. If the gas flows at the rate of W lb. per hour, and if p be the perimeter of the flue in inches, the coefficient M has the form given by the equation

$$\log M = B - m \log W/p$$

In flues of irregular section the perimeter p is found by dividing the heat-transfer surface in contact with the gas by the length of travel of gas, all dimensions being in inches.

The coefficients B and m depend on the mean hydraulic depth of the flue. In flues of circular section, the diameter is four times the hydraulic depth. The relation between the flue diameter d and the coefficients B and m is given by the equations

$$\log (B - 1.3) = 1.71 - 0.54 \log d$$

$$\log m = 1.36 - 0.37 \log d$$

For flues of sections other than circular the value of d is found by multiplying the mean hydraulic depth by four. Mean hydraulic depth is equal to area of cross-section divided by perimeter.

Equations [1] and [2] can be used with confidence with flues of circular or of annular section up to 2 in. in diameter and can probably be applied to larger flues of irregular section such as the gas passages in a water-tube boiler.

[*L. H. Fry. Trans., vol. 39, pp. 709 and 710*]

SMOKELESS COMBUSTION

A long series of investigations covering some thousand separate and distinct studies of boiler settings demonstrated that draft is so important that it overshadows every other consideration. Fig. 5 shows how much draft is needed for different rates of combustion. Roughly the rule is this: 0.1 in. draft over

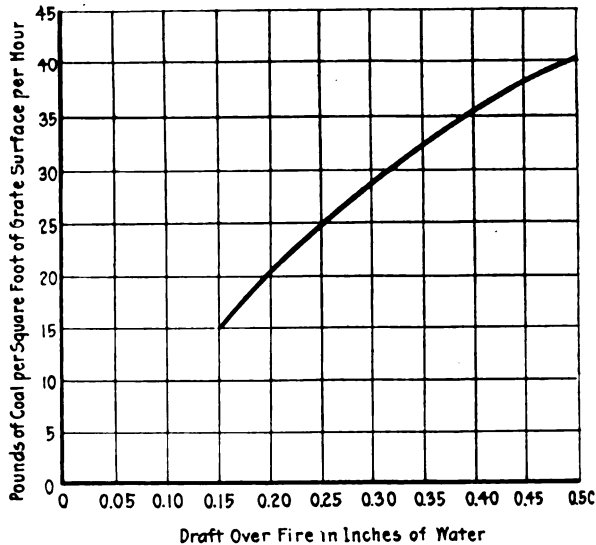


FIG. 5 DRAFT FOR SMOKELESS COMBUSTION

the fire is needed per pound of coal burned per square foot of grate surface per hour. Beginning with 0.15 in. per sq. ft. over the fire, it is possible to burn 15 lb. coal per square foot of grate surface per hour smokelessly.

The limit rate of successful smokeless combustion for hand-fired units is about 28 lb. coal per square foot of grate surface per hour.

[*Journal, April 1917, p. 345*]

[Source: *Proceedings of the Engineers' Society of Western Pennsylvania*, December 1916, p. 772]

RELATION OF PORT AREA TO POWER OF GAS ENGINE

The port area of a gas engine may be determined from

$$A = \frac{Q}{0.518 \sqrt{2gh}} \times \frac{p_2}{p_1}$$

where Q = cu. ft. of mixture entering the cylinder, measured under atmospheric conditions

h = head in feet of gas necessary to produce the pressure head causing the flow

p_2 = pressure in the cylinder at the end of the suction stroke

p_1 = barometric pressure.

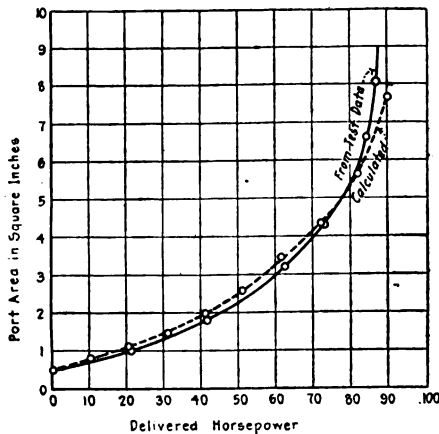


FIG. 6 RELATION BETWEEN DELIVERED HORSEPOWER AND PORT AREA FROM TEST AND CALCULATIONS

In Fig. 6 there are two curves showing the relation between delivered horsepower and port area; one is based on test data and the other is plotted from calculated data for the same engine.

[J. R. Du Priest. *Trans.*, vol. 39, p. 387]

585

THE COOLING OF WATER FOR POWER-PLANT PURPOSES

The efficiency E of a cooling pond or tower may be expressed as the ratio between the cooling actually produced, $T_1 - T_2$, and that which would have resulted from cooling the water down to the wet-bulb temperature T_w . Thus the efficiency

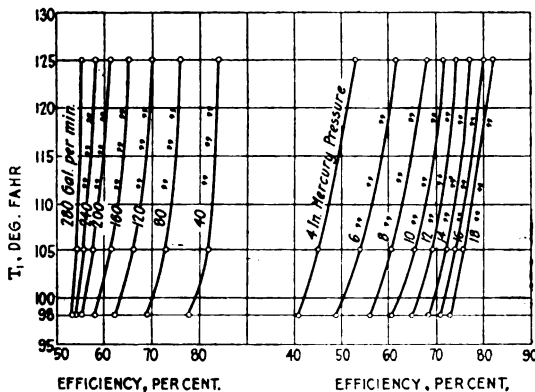


FIG. 7 CURVES FOR PREDICTING COOLING RANGE TO BE EXPECTED FROM A GIVEN SET OF CONDITIONS

$$E = \frac{T_1 - T_2}{T_1 - T_w}$$

T_1 and T_2 being the temperatures of the water before and after cooling, respectively.

The cross curves on Fig. 7 were drawn from the results of an extended experimental investigation, and may be used for predicting the cooling range $T_1 - T_2$ to be expected from a given set of conditions, as follows:

$$T_1 - T_2 = E(T_1 - T_w)$$

E for any given initial temperature T_1 and for any given pressure at the nozzle, may be found from these curves. If an initial temperature of water, T_i , and an average air temperature, T_a , and humidity be assumed for the locality, then T_w may be computed by taking from a humidity table the value of $T_a - T_w$.

[C. C. Thomas. *Trans.*, vol. 39, pp. 627 and 633]

LATENT HEAT OF AMMONIA

Table 4 was obtained from a series of computed values corrected for heat-dissipation errors.

TABLE 4 PRACTICAL LATENT HEAT OF AMMONIA

F°	r	F°	r	F°	r	F°	r	F°	r
—108	729	8	558	36	535	64	514	92	493
—100	709	9	557.5	37	534.5	65	513.5	93	492.5
—90	687	10	557	38	534	66	513	94	492
—80	667	11	556	39	533	67	512.5	95	491
—70	650	12	555	40	532	68	512	96	490
—60	635	13	554	41	531.5	69	511	97	489
—50	622	14	553	42	531	70	510	98	488
—40	608	15	552.5	43	530	71	509	99	487
—30	597	16	552	44	529	72	508	100	486
—20	585	17	551	45	528.5	73	507.5	110	476
—10	575	18	550	46	528	74	507	120	465
—9	574	19	549	47	527.5	75	506	130	454
—8	573	20	548	48	527	76	505	140	441
—7	572.5	21	547.5	49	526	77	504	150	426
—6	572	22	547	50	525	78	503	160	409
—5	570.5	23	546	51	524	79	502.5	170	391
—4	569	24	545	52	523	80	502	180	371
—3	568.5	25	544	53	522.5	81	501	190	350
—2	568	26	543	54	522	82	500	200	328
—1	567	27	542.5	55	521	83	499	210	305
0	566	28	542	56	520	84	498	220	280
+ 1	564.5	29	541	57	519	85	497.5	230	252
2	563	30	540	58	518	86	497	240	220
3	562.5	31	539	59	517.5	87	496.5	250	181
4	562	32	538	60	517	88	496	260	131
5	561	33	537.5	61	516.5	89	495	270	68
6	560	34	537	62	516	90	494	273	46
7	559	35	536	63	515	91	493.5	...	...

[*Journal*, May 1917, p. 474]

[Source: *Ice and Refrigeration*, April 1917, p. 177]

SURFACE RESISTANCE WITH GLASS AS TRANSMISSION MEDIUM

The results of an extensive series of tests carried out in the thermal testing plant of the Pennsylvania State College are shown in Fig. 8. It can be seen that the resistance of the glass is very slight as compared with that of the air surfaces. This proves that in figuring transmission through glass the resistance of the air layers at the given conditions will be the primary factors, since from

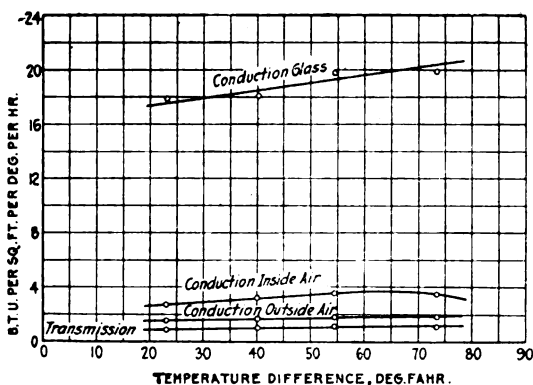


FIG. 8 CONDUCTIONS THROUGH AIR SURFACES AND GLASS

the figure it is shown that they form the bulk of the resistance which goes to make up the combined transmission factor.

[H. R. Hammond and C. W. Holmberg. *Trans.*, vol. 39, p. 765]

MOISTURE CONTENT OF TEXTILES AND SOME OF ITS EFFECTS

587

The laws of regain in cotton and worsted may be summarized in the following manner:

First. The general law for cotton and worsted, and probably for any other textile fiber is expressed by the formula

$$KRT^3 = H \times 5771.44 \times 10^8$$

in which H represents any given relative humidity expressed decimally; R the regain at any absolute temperature T ; K a variable coefficient depending upon H , R and T in such a way that for $H = 1$, or saturation, the product KRT^3 is a constant quantity represented by the number 5771.44×10^8 . In this, 5771.44 is the weight in grains of a cubic foot of aqueous vapor at any temperature multiplied by the corresponding absolute temperature in degrees fahrenheit, divided by the maximum elastic force of aqueous vapor at that temperature expressed in inches of mercury.

Second. For any given temperature the relation of values of R to the variable K , for both worsted and cotton, is expressed by a hyperbolic equation, differing for each substance.

Third. For any other temperatures the law for worsted is: For the same humidity the squares of the regains at different temperatures are to each other inversely as the cubes of the corresponding absolute temperatures.

Fourth. The law for cotton is: For the same humidity the first powers of the regains at different temperatures are to each other inversely as the first powers of the corresponding absolute temperatures.

[William D. Hartshorne. *Trans.*, vol. 39, pp. 1100 and 1101]

SPARK LENGTHS IN VARIOUS GASES AND VAPORS

Table 5 represents the results obtained from an investigation conducted to determine the length of spark obtainable in a vapor or gas compared to the length of spark obtainable in air at the same temperature and with the same difference of potential.

TABLE 5 RELATIVE SPARK LENGTHS IN MILLIMETERS

Substance	Air gap 30 mm.	Air gap 20 mm.	Temperature deg. cent.
Methane.....	29	20	100
Methyl chloride.....	24	16	100
Methylene chloride.....	9	6	100
Chloroform.....	5	3.5	100
Carbon tetrachloride.....	1.5	1	100
Methyl bromide.....	12	9	100
Methyl iodide.....	8.5	5.5	100
Ethane.....	24	18	100
Ethyl chloride.....	21	16	100
Ethyl bromide.....	9	6.5	100
Ethyl iodide.....	6.5	4.5	100
Ethylene.....	35	27	100
Acetylene.....	32	26	100
Water.....	40	36	138
Methyl alcohol.....	30	26	138
Ethyl alcohol.....	23	19	138
iso-Propyl alcohol.....	18	15	138
iso-Butyl alcohol.....	16	13	138
Ethyl formate.....	14	..	138
Ethyl acetate.....	11	..	138
Ethyl propionate.....	8	..	138
Carbon dioxide.....	16	11	100
Sulphur dioxide.....	10	6	100
Carbon disulphide.....	8	5	100
Hydrogen sulphide.....	17	12	100

[*Journal*, October 1917, p. 887]

[Source: *Journal of the Chemical Society*, July 1917, p. 643]

**DATA SECTION
PART III**

**List of Transactions
Papers**

589

Pages 591-619

Since the organization of The American Society of Mechanical Engineers in 1880 many valuable data resulting from researches and investigations have been presented before the Society in the form of papers and included in the thirty-nine volumes of TRANSACTIONS which have been issued. For the convenience of engineers who wish to refer to this material, there is published herewith a list of these technical papers, alphabetically arranged according to subjects. Many of these papers are available in pamphlet form at a nominal charge. Practically all of those recently presented are obtainable, and while some of the earlier ones are out of stock, a large number of those most in demand is still to be had.

Each entry gives the title of the paper, followed by the name of the author, the number of the paper (in parenthesis), volume, years covered (in parenthesis), and page number.

LIST OF TRANSACTIONS PAPERS

A

Abbreviations in technical papers, standardizing (1054), vol. 26 (1904-1905), p. 60
 Abrasive wheels, safety code for use and care of (1523), vol. 37 (1915-1916), p. 1221
 Accelerometer, portable, for railway testing, F. B. Corey (927), vol. 23 (1901-1902), p. 327
 Accident-preventing devices, applied to machines, J. H. Cooper (427), vol. 12 (1890-1891), p. 249
 Accident prevention and workmen's compensation, attitude of employer towards, W. H. Cameron (1512), vol. 37 (1915-1916), p. 899
 Adiabatics, DeVolson Wood (728), vol. 18 (1896-1897), p. 691
 Aeronautics, military, present status of, Geo. O. Squier (1210), vol. 30 (1908-1909), p. 639
 Air and steam, flow of, through orifices, Herbert B. Reynolds (1555), vol. 38 (1916-1917), p. 799
 Air compressors. See compressors.
 Air-conditioning apparatus, Willis H. Carrier and Frank L. Bussey (1341), vol. 33 (1911-1912), p. 1055
 Air engines, compressors and steam engines, valves for, F. W. Gordon (824), vol. 20 (1898-1899), p. 967
 Air engines. See engines.
 Air, flow of, through thin-plate orifices, Ernest O. Hickstein (1506), vol. 37 (1915-1916), p. 765
 Air flow, measurement of, through thin plate orifices, R. J. Durely (1098), vol. 27 (1905-1906), p. 193
 Alloys, aluminum, mechanical properties of, R. C. Carpenter (774), vol. 19 (1897-1898), p. 511
 Alternators, engine driven flywheel effect, W. I. Slichter (956), vol. 24 (1902-1903), p. 98
 Aluminum, experiment with, W. W. Christie (487), vol. 13 (1891-1892), p. 393
 Ammonia, anhydrous, physical properties of, L. S. Marks and F. W. Loomis (1364), vol. 34 (1912-1913), p. 782
 Ammonia. See sulphur dioxide and ammonia.
 Ammonia gas as a motive power, T. M. W. Draper (538), vol. 14 (1892-1893), p. 762
 Ammonia, properties of, De Volson Wood (342), vol. 10 (1888-1889), p. 627; (418), vol. 12 (1890-1891), p. 133
 Anglemeter, indicating, Chas E. Sargent (986), vol. 24 (1902-1903), p. 992
 Annealing, effects of, Wm. Campbell (1034), vol. 25 (1903-1904), p. 599
 Apparatus used in testing materials, Gus. C. Henning (175), vol. 6 (1884-1885), p. 479
 Appraisals, accurate, by short methods, John G. Morse (1574), vol. 38 (1916-1917), p. 1220
 Appraisal value, and perpetual-inventory value, relation between, Charles Plez (1576), vol. 38 (1916-1917), p. 1285
 Arch curves, equilibrium of, H. H. Suplee (394), vol. 11 (1889-1890), p. 903
 Assembling, small and intricate machine, process of, Halcomb Ellis (1312b), vol. 33 (1911-1912), p. 211
 Automatic sprinklers. See sprinklers.
 Automatic stokers. See stokers.
 Automobile engines. See engines.
 Automobile transmission, investigation of efficiency of worm gearing for, Wm. H. Kenerson (1371), vol. 34 (1912-1913), p. 919
 Automobile wagon for heavy duty, Arthur Herschmann (856), vol. 21 (1899-1900), p. 844

Automobiles, materials for, Elwood Haynes (1148), vol. 29 (1907-1908), p. 209
 Auxiliary engines. See engines.
 Averaging instrument, Coffin's, John E. Sweet (44), vol. 2 (1881), p. 342
 Averaging machines, W. S. Auchincloss (69), vol. 3 (1882), p. 220
 Axle for a motor truck, John Younger (1482), vol. 37 (1915-1916), p. 151
 Axles (locomotive), parallel and radial, operation of, by a single set of cylinders, Anatole Mallet (1502), vol. 37 (1915-1916), p. 653

B

Balance, dynamic, N. W. Akimoff (1539), vol. 38 (1916-1917), p. 367
 Balance dynamometer. See dynamometer.
 Ball bearing lineshaft hangers, Henry Hess (1286), vol. 32 (1910-1911), p. 533
 Ball bearings, Henry Hess (1159), vol. 29 (1907-1908), p. 367
 Ball step bearings, some experiments on, C. H. Benjamin (899), vol. 22 (1900-1901), p. 732
 Beams, concrete, stresses in reinforced, Gaetano Lanza and L. S. Smith (1252), vol. 31 (1909-1910), p. 511
 Beams, deflection of, by graphics, W. Trinks (957), vol. 24 (1902-1903), p. 116
 Beams, large spruce, tests of strength and stiffness of, Gaetano Lanza (94), vol. 4 (1882-1883), p. 119
 Beams, rectangular concrete, design of, Howard Harding (1485), vol. 37 (1915-1916), p. 225
 Bearing metals, microstructure and frictional characteristics of, Melvin Price (1088), vol. 26 (1904-1905), p. 669
 Bearings (1103), vol. 27 (1905-1906), p. 420
 Bearings, ball, Henry Hess (1159), vol. 29 (1907-1908), p. 367
 Bearings, ball step, some experiments on, C. H. Benjamin (899), vol. 22 (1900-1901), p. 732
 Bearings, crank shaft, production of, H. See (211), vol. 7 (1885-1886), p. 521
 Bearings, expansion, for bridge superstructures, G. S. Morison (566), vol. 15 (1893-1894), p. 153; (639), vol. 16 (1894-1895), p. 724 (second paper)
 Bearings, journal, laws of lubrication, M. D. Hersey (1483), vol. 37 (1915-1916), p. 167
 Bearings, lineshaft, comparative tests of three types of, Carl C. Thomas, E. R. Maurer, and L. E. A. Kelso (1410), vol. 35 (1913-1914), p. 593
 Bearings, self-lubricating, graphite for, J. H. Cooper (486), vol. 13 (1891-1892), p. 374
 Belt conveyors. See conveyors.
 Belt creep, W. W. Bird (1083), vol. 26 (1904-1905), p. 584
 Belt drives, main, protection of, with fire retardant partitions, C. H. Smith (1393d), vol. 35 (1913-1915), p. 239
 Belt dynamometer. See dynamometer.
 Belt, oak-tanned leather, effect of relative humidity on, William W. Bird and Francis W. Roy (1480), vol. 37 (1915-1916), p. 129
 Belt, relation between initial tension and power transmitted by, F. L. Emory (808), vol. 20 (1898-1899), p. 466
 Belt tensions, variation of power transmitted with, Wm. S. Aldrich (797), vol. 20 (1898-1899), p. 136
 Belt-testing machine, new, G. I. Alden (444), vol. 12 (1890-1891), p. 700

- Belting, connections to shafts, J. B. Webb (98), vol. 4 (1882-1883), p. 165
- Belting, experiments on transmission of power by, Wilfred Lewis (213), vol. 7 (1885-1886), p. 549
- Belting, leather, transmission of power by, Carl G. Barth (1230), vol. 31 (1909-1910), p. 29
- Belting, notes on, F. W. Taylor (568), vol. 15 (1893-1894), p. 204
- Belting, tests of comparative value of different kinds of, Samuel Webber (251), vol. 8 (1886-1887), p. 529
- Belting, transmission of power by, Gaetano Lanza (202), vol. 7 (1885-1886), p. 347
- Belts as grain conveyors, T. W. Hugo (171), vol. 6 (1884-1885), p. 400
- Belts, driving, tests of, Samuel Webber (506), vol. 14 (1892-1893), p. 59
- Belts, leather, experiments on adhesion of, Samuel Webber (37), vol. 2 (1881), p. 230
- Belts, leather, formula for horsepower of, A. F. Nagle (27), vol. 2 (1881), p. 92
- Belts, leather, tractive force of, on pulley faces, Scott A. Smith (351), vol. 10 (1888-1889), p. 765
- Bessemer plant, adaptation of, to the basic process, A. L. Holley (10), vol. 1 (1880), p. 130
- Bessemer process, basic, Thomas Eggleston (188), vol. 7 (1885-1886), p. 34
- Bessemer process, historical and technical sketch of origin of, Henry Bessemer (720), vol. 18 (1896-1897), p. 455
- Bessemer steel, original plant at Troy, R. W. Hunt (155), vol. 6 (1884-1885), p. 61
- Beton, in combination with iron as building material, W. E. Ward (126), vol. 4 (1882-1883), p. 388
- Bevel gears. See gears.
- Binary absorption system of ice machinery, H. F. J. Porter (36), vol. 2 (1881), p. 218
- Bituminous coals. See coals.
- Blast furnace, blowing engine for, F. W. Gordon (441), vol. 12 (1890-1891), p. 676
- Blast-furnace gas. See gas.
- Blast-furnace gas-power plants, large (1314), vol. 33 (1911-1912), p. 293
- Blast-furnace gas-power plant, operating experiences with, H. J. Freyn (1281), vol. 32 (1910-1911), p. 369
- Blowers, experiments and experiences with, Henry I. Snell (264), vol. 9 (1887-1888), p. 51
- Blowing engine. See engine.
- Blueprint machine, curved-glass, P. M. Chamberlain (847), vol. 21 (1899-1900), p. 586
- Blueprinting by electric light, H. G. Reist (904), vol. 22 (1900-1901), p. 888
- Boiler, 1000-h.p., B. & W., tests of, B. N. Bump (1362), vol. 34 (1912-1913), p. 687
- Boiler and furnace efficiency, R. S. Hale (819), vol. 20 (1898-1899), p. 769
- Boiler and setting, A. Bement (1125), vol. 28 (1906-1907), p. 509
- Boiler bracing experiments, Francis J. Cole (743), vol. 18 (1896-1897), p. 989
- Boiler chimneys, dimensions of for fuel oil, C. R. Weymouth (1361), vol. 34 (1912-1913), p. 639
- Boiler committee, discussion on report of (828), vol. 21 (1899-1900), p. 112
- Boiler efficiency and combustion, Edw. A. Uehling (1298), vol. 32 (1910-1911), p. 1215
- Boiler explosion, F. H. Daniels (511), vol. 14 (1892-1893), p. 118
- Boiler explosions, investigations of, Gus C. Henning (814), vol. 20 (1898-1899), p. 649
- Boiler feed, tests on Venturi Meter for, C. M. Allen (1254), vol. 31 (1909-1910), p. 589
- Boiler fuel, tan bark as, D. M. Myers (1258), vol. 31 (1909-1910), p. 685
- Boiler grate, efficiency of, W. W. Christie (717), vol. 18 (1896-1897), p. 365
- Boiler heating, experiments on using gasoline gas for, Herman Poole (831), vol. 21 (1899-1900), p. 172
- Boiler heating surface, efficiency of, R. S. Hale (716), vol. 18 (1896-1897), p. 328
- Boiler inspection, protective value of, F. B. Allen (98), vol. 4 (1882-1883), p. 142
- Boiler joints, pencil electrode method of welding, E. A. Wildt (1569), vol. 38 (1916-1917), p. 1141
- Boiler making, helical seams in, R. H. Thurston (242), vol. 8 (1886-1887), p. 357
- Boiler of the Purdue locomotive, tests of, W. F. M. Goss (885), vol. 22 (1900-1901), p. 453
- Boiler plants, task setting for firemen, Walter N. Polakov (1401), vol. 35 (1913-1914), p. 347
- Boiler plate, rivet steel, steel castings, and steel forgings, specifications for (979), vol. 24 (1902-1903), p. 921
- Boiler plate, rivet steel, steel castings and steel forgings, report of committee on specifications for (1026), vol. 25 (1903-1904), p. 321
- Boiler plates, steel, steel forgings, and steel castings, specifications for, W. R. Webster (945), vol. 23 (1901-1902), p. 632
- Boiler, portable, tests of, W. O. Webber (489), vol. 13 (1891-1892), p. 413
- Boiler, results of trials by the Ohio State University, E. A. Hitchcock (997), vol. 24 (1902-1903), p. 1193
- Boiler setting, G. W. Bissell (752), vol. 19 (1897-1898), p. 74
- Boiler, steam, efficiency of, William Kent (694), vol. 17 (1895-1896), p. 645
- Boiler, steam, heating surface of, Chas. W. Baker (775), vol. 19 (1897-1898), p. 571
- Boiler, suspension and setting of horizontal fire-tube, O. C. Woolson (784), vol. 19 (1897-1898), p. 781
- Boiler, Talbot, Paul A. Talbot (1568), vol. 38 (1916-1917), p. 1117
- Boiler tests: classification of data and plotted results, W. W. Christie (765), vol. 19 (1897-1898), p. 330
- Boiler tests, flue gas analyses in, R. S. Hale (740), vol. 18 (1896-1897), p. 901
- Boiler tests, rules for conducting, William Kent (147), vol. 5 (1883-1884), p. 260
- Boiler tests, tables for facilitating calculations of, William Kent (159), vol. 6 (1884-1885), p. 84
- Boiler trials, steam, discussion of report of committee on standard method of (168a), vol. 6 (1884-1885), p. 314
- Boiler trials, steam, report of committee on standard method of (168), vol. 6 (1884-1885), p. 256
- Boiler trials, steam, report of committee on revision of society code of 1885 on standard method of conducting (827), vol. 21 (1899-1900), p. 34
- Boiler tube joints, rolled, slipping point of, O. P. Hood & G. L. Christensen (1225), vol. 30 (1908-1909), p. 1181
- Boiler, tests of, using grates with small percentage of air openings, F. A. Scheffler (575), vol. 15 (1893-1894), p. 503
- Boilers, ancient Pompeian, W. T. Bonner (706), vol. 18 (1896-1897), p. 113
- Boilers and marine engines, probable limit of steam pressure in, Chas. E. Emery (248), vol. 8 (1886-1887), p. 472
- Boilers, best form of longitudinal joint for, F. W. Dean (1262), vol. 31 (1909-1910), p. 823
- Boilers, efficiency of, F. W. Dean (650), vol. 16 (1894-1895), p. 962
- Boilers, experience with leaky vertical fire tube, F. W. Dean (1261), vol. 31 (1909-1910), p. 799
- Boilers, fire tube, consideration of steam drums, F. W. Dean (1500), vol. 37 (1915-1916), p. 619
- Boilers, fire-tube, forcing capacity of, F. W. Dean (1058), vol. 26 (1904-1905), p. 92
- Boilers, horizontal tubular, new method of constructing, F. A. Scheffler (161), vol. 6 (1884-1885), p. 110
- Boilers, horizontal water tube, circulation in, Paul A. Bancel (1516), vol. 37 (1916-1917), p. 1011
- Boilers, house-heating, testing of, L. P. Breckenridge and D. B. Prentice (1545), vol. 38 (1916-1917), p. 491

Boilers, large, operation of, at Detroit Edison Company, J. W. Parker (1400), vol. 35 (1913-1914), p. 313

Boilers, large, tests of at the Detroit Edison Company, D. S. Jacobus (1328), vol. 33 (1911-1912), p. 565

Boilers, locomotive, strains in, L. S. Randolph (302), vol. 9 (1887-1888), p. 534

Boilers, novel method of handling, to prevent corrosion and scale, Allen H. Babcock (1520), vol. 37 (1915-1916), p. 1105

Boilers, shell and water-tube, Allan Stirling (178), vol. 6 (1884-1885), p. 566

Boilers, steam, adaptation of, to warming dwelling houses, John W. Anderson (179), vol. 6 (1884-1885), p. 619

Boilers, steam, as magazines of explosive energy, R. H. Thurston (165), vol. 6 (1884-1885), p. 199

Boilers, steam, brick settings of, Wm. Barnet LeVan (795), vol. 20 (1898-1899), p. 95

Boilers, steam, comparative test of, with different kinds of coal, C. E. Emery (677), vol. 17 (1895-1896), p. 237

Boilers, steam, comparison of rules for calculating strength of, H. deB. Parsons (873), vol. 22 (1900-1901), p. 127

Boilers, steam, down-draft furnace for, W. H. Bryan (644), vol. 18 (1894-1895), p. 773

Boilers, steam, effect of circulation in, Geo. H. Barrus (298), vol. 9 (1887-1888), p. 489

Boilers, steam, effect of retarders in fire tubes of, Jay M. Whitham (687), vol. 17 (1896-1897), p. 450

Boilers, steam, kerosene in, R. C. Carpenter (396), vol. 11 (1889-1890), p. 937

Boilers, steam, lifetime or age of, W. B. LeVan (54), vol. 2 (1881), p. 516

Boilers, steam, oil fuel for, B. R. T. Collins (1308), vol. 33 (1911-1912), p. 83

Boilers, steam, rating of, by horse-powers for commercial purposes, W. P. Trowbridge and C. B. Richards (190), vol. 7 (1885-1886), p. 214

Boilers, steam, report of committee to formulate standard specifications for the construction of (1469), vol. 36 (1914-1915), p. 977

Boilers, steam, strain measurements of, under hydrostatic pressure, James E. Howard (1329), vol. 33 (1911-1912), p. 639

Boilers, steam, use of crude petroleum in, L. F. Lyne (350), vol. 10 (1888-1889), p. 350

Boilers, steam, use of kerosene oil in, Lewis F. Lyne (275), vol. 9 (1887-1888), p. 247

Boilers, transmission of heat in, E. R. Hedrick and E. A. Fessenden (1541), vol. 38 (1916-1917), p. 407

Boilers at Roxbury pumping station, trial of, J. S. Coon (75), vol. 3 (1882), p. 309

Boilers, use of natural gas under, Jay M. Whitham (1097), vol. 27 (1905-1906), p. 171

Boilers, vertical fire tube, use of corrugated furnaces for, F. W. Dean (1475), vol. 37 (1915-1916), p. 31

Boilers, water-tube, discharge of water with steam, A. Bement (1069), vol. 26 (1904-1905), p. 312

Bolt, threading device, James Hartness (754), vol. 19 (1897-1898), p. 81

Bonus system of rewarding labor, H. L. Gantt (928), vol. 23 (1901-1902), p. 341

Bore of high-speed wheels, increase of, by centrifugal stresses, Sanford A. Moss (1370), vol. 34 (1912-1913), p. 895

Boring and facing machine, special form of, W. S. Russel (890), vol. 22 (1900-1901), p. 547

Boring and turning mill, 60-ft. vertical, description of, John Riddell (1000), vol. 24 (1902-1903), p. 1288

Braces, staybolts and flat surfaces, R. S. Hale (1061), vol. 26 (1904-1905), p. 177

Brake, pony, new form of, R. C. Carpenter (559), vol. 15 (1893-1894), p. 62

Brakes, air, for heavy steel passenger cars, A. L. Humphrey (1388a), vol. 35 (1913-1914), p. 66

Brakes, application of, to truck wheels of a

locomotive, Gaetano Lanza (610), vol. 16 (1894-1895), p. 69

Brakes, clasp, for heavy-passenger equipment cars, T. L. Burton (1564), vol. 38 (1916-1917), p. 1005

Bridge structures, railroad bed for, O. C. Woolson (278), vol. 9 (1887-1888), p. 276

Bridge superstructures, expansion bearings for, G. S. Morison (566), vol. 15 (1893-1894), p. 153; (639), vol. 16 (1894-1895), p. 724

Bronzes, manganese and other, elastic limit of, J. A. Capp (283), vol. 32 (1910-1911), p. 507

Buckeye engine valve gear. See engine.

Buildings, crowded, life hazard in, due to inadequate exits, H. F. J. Porter (1393e), vol. 35 (1913-1914), p. 249

Buildings, dustless, C. J. H. Woodbury (757), vol. 19 (1897-1898), p. 104

By-product coke oven, W. H. Blauvelt (1201), vol. 30 (1908-1909), p. 383

C

Cable-making, improvements in art of, Emil Guilleaume (530), vol. 14 (1892-1893), p. 626

Cable road construction, Frank Van Vleck (416), vol. 12 (1890-1891), p. 56

Calibration of weir, and tests of centrifugal pumps at the Bridgeport Pumping Station, Chicago, Ill., R. C. Carpenter (763), vol. 19 (1897-1898), p. 255

Calibration of Worthington water meter, John A. Laird (708), vol. 18 (1896-1897), p. 134

Calorimeter as pyrometer for high temperatures, J. C. Hoadley (23), vol. 2 (1881), p. 42

Calorimeter, coal, Geo. H. Barrus (541), vol. 14 (1892-1893), p. 816

Calorimeter, coal, new, R. C. Carpenter (653), vol. 16 (1894-1895), p. 1040

Calorimeter, experiments with throttling, A. A. Goubert and E. H. Peabody (672), vol. 17 (1895-1896), p. 151

Calorimeter, gas, simple continuous, C. E. Lucke (1187), vol. 30 (1908-1909), p. 27

Calorimeter, new, Geo. H. Barrus (236), vol. 8 (1886-1887), p. 235

Calorimeter, simple, C. H. Peabody (323), vol. 10 (1888-1889), p. 327

Calorimeter, steam, new form of, Geo. H. Barrus (194), vol. 7 (1885-1886), p. 178

Calorimeter, steam, new form of, R. C. Carpenter (692), vol. 17 (1895-1896), p. 608

Calorimeter, steam, universal, Geo. H. Barrus (387), vol. 11 (1889-1890), p. 790

Calorimeters, accuracy of small throttling, D. S. Jacobus (628), vol. 16 (1894-1895), p. 448

Calorimeters, errors of different types of, C. H. Peabody and A. L. Williston (364), vol. 11 (1889-1890), p. 193

Calorimeters, notes regarding, R. C. Carpenter (452), vol. 12 (1890-1891), p. 825

Calorimeters, reliability of throttling, J. E. Denton (673), vol. 17 (1895-1896), p. 175

Calorimeters, throttling, accuracy of small, D. S. Jacobus (628), vol. 16 (1894-1895), p. 448

Calorimetry, coal, Berthier method of, C. V. Kerr (838), vol. 21 (1899-1900), p. 304

Cam for actuating valves of high-speed steam engines, description of, Chas. T. Porter (616), vol. 16 (1894-1895), p. 117

Cam, steamboat, Lewis Johnson (31), vol. 2 (1881), p. 124

Cams, new process for cutting, W. A. Gabriel (509), vol. 14 (1892-1893), p. 82

Car design, steel passenger, H. H. Vaughan (1388a), vol. 35 (1913-1914), p. 17

Car design, steel passenger, discussion on (1388n), vol. 35 (1913-1914), p. 93

Car design, steel passenger, problems of, W. F. Kiesel, Jr. (1388b), vol. 35 (1913-1914), p. 21

Car-heating system, Henry R. Towne (294), vol. 9 (1887-1888), p. 453

Car, self-propelled, S. J. MacFarren (370), vol. 11 (1889-1890), p. 254

- Car wheels, manufacture of, G. R. Henderson (812), vol. 20 (1898-1899), p. 615
- Car wheels, rolled cast steel, Jacob Reese (42), vol. 2 (1881), p. 300
- Carbon in nickel and manganese steel, comparison of the properties of, before and after heat treatment, Robert R. Abbott (1476), vol. 37 (1915-1916), p. 39
- Carbonic acid, physical properties of, and conditions of its economic storage for transportation, R. T. Stewart (1224), vol. 30 (1908-1909), p. 1111
- Cars, heavy-passenger-equipment, clasp brakes for, T. L. Burton (1565), vol. 38 (1916-1917), p. 1005
- Cars, heavy steel passenger, air brakes for, A. L. Humphrey (1388k), vol. 35 (1913-1914), p. 66
- Cars, passenger, four-wheel trucks for, Roy V. Wright (1503), vol. 37 (1915-1916), p. 689
- Cars, passenger, six-wheel trucks for, John A. Pilcher (1388f), vol. 34 (1913-1914), p. 37
- Cars, railroad, notes on warming, W. J. Baldwin (296), vol. 9 (1887-1888), p. 471
- Cars, steel, cast-steel double-body bolsters, platforms and end frames for, C. T. Westlake (1388g), vol. 35 (1913-1914), p. 69
- Cars, steel frame box, discussion on (1405c), vol. 35 (1913-1914), p. 491
- Cars, steel passenger, provisions for electric lighting, H. A. Currie (1388g), vol. 35 (1913-1914), p. 60
- Cars, steel motor, provision for electrical equipment on, F. W. Butt (1388f), vol. 35 (1913-1914), p. 63
- Cars, steel passenger, painting of, C. D. Young (1388h), vol. 35 (1913-1914), p. 49
- Cars, steel passenger, special ends for, H. M. Estabrook (1388m), vol. 35 (1913-1914), p. 74
- Cars, steel passenger, steel interior finish for, Felix Koch (1388g), vol. 35 (1913-1914), p. 45
- Cars, steel passenger, underframes for, John McE. Ames (1388c), vol. 34 (1913-1914), p. 25
- Cars, steel, roof structure for, C. A. Seley (1388d), vol. 35 (1913-1914), p. 31
- Cars, steel, suspension of, E. W. Summers (1388e), vol. 35 (1913-1914), p. 33
- Cars, steel underframe box, George W. Rink (1405a), vol. 35 (1913-1914), p. 425
- Cars, steel upperframe box, R. W. Burnett (1405b), vol. 35 (1913-1914), p. 469
- Case carbonizing, Marcus T. Lothrop (1372), vol. 34 (1912-1913), p. 939
- Cast iron and steel, influence of titanium on properties of, A. J. Rossi (892), vol. 22 (1900-1901), p. 570
- Cast iron; crushing loads and microstructure, W. L. Keep (1078), vol. 26 (1904-1905), p. 483
- Cast-iron cylinders, experiments on, C. H. Benjamin (776), vol. 19 (1897-1898), p. 597
- Cast iron flywheels, bursting of small, C. H. Benjamin (800), vol. 20 (1898-1899), p. 209
- Cast-iron fittings. See fittings.
- Cast-iron fittings for superheated steam. See fittings.
- Cast iron for machine-tool parts, Henry M. Wood (1416), vol. 35 (1913-1914), p. 799
- Cast iron, new process for chilling and hardening, Thos. D. West (1350), vol. 34 (1912-1913), p. 235
- Cast-iron plates, pickled in nitric acid, heat transmission through, R. C. Carpenter (421), vol. 12 (1890-1891), p. 174
- Cast-iron plates, pickled in acid, heat transmission through, Daniel Royse (461), vol. 12 (1890-1891), p. 1014
- Cast-iron, relative tests of, W. J. Keep (631), vol. 16 (1894-1895), p. 542
- Cast iron; strength, composition and specifications, W. J. Keep (1041), vol. 25 (1903-1904), p. 884
- Cast iron, strength of, Wm. J. Keep (695), vol. 17 (1895-1896), p. 674
- Cast iron, test bars, report on, A. F. Nagle (1268), vol. 31 (1909-1910), p. 977
- Cast iron, tests of strength of, Gaetano Lanza (318), vol. 10 (1888-1889), p. 187
- Cast-iron, transverse strength of, W. J. Keep (655), vol. 16 (1894-1895), p. 1082
- Cast iron under impact, W. J. Keep (766), vol. 19 (1897-1898), p. 351
- Casting aluminum-bronze, and other strong metals, T. D. West (237), vol. 8 (1886-1887), p. 245
- Castings, die, Amasa Trowbridge (1334), vol. 33 (1911-1912), p. 839
- Castings, iron, contraction and deformation of in cooling from fluid to solid state, Francis Schumann (718), vol. 18 (1896-1897), p. 394
- Castings, iron, irregularity in contraction of, T. D. West (206), vol. 7 (1885-1886), p. 422
- Castings, sound, Thos. D. West (160), vol. 6 (1884-1885), p. 94
- Castings, steel, H. L. Gantt (445), vol. 12 (1890-1891), p. 710
- Castings, steel, recent progress in manufacture of, H. L. Gantt (589), vol. 15 (1893-1894), p. 260
- Castings, steel, steel forgings, and steel boiler plates, specifications for, W. R. Webster (945), vol. 23 (1901-1902), p. 632
- Castings, steel, steel forgings, boiler plate and rivet steel, report of committee on specifications for (1028), vol. 25 (1903-1904), p. 321
- Castings, steel, steel forgings, boiler plate and rivet steel, specifications for (979), vol. 24 (1902-1903), p. 921
- Castings, volumnar contraction of, in cooling, Francis Schumann (725), vol. 18 (1896-1897), p. 665
- Catalogue system and classification for engineering library, F. R. Hutton (686), vol. 17 (1895-1896), p. 422
- Catalogues, standard sizes of (1394), vol. 35 (1913-1914), p. 269
- Cement, discussion (1311d), vol. 33 (1911-1912), p. 175
- Cement industry, pulverized coal burning in, R. C. Carpenter (1431a), vol. 36 (1913-1914), p. 85
- Cement industry, some problems of, Walter S. Landis (1311a), vol. 33 (1911-1912), p. 133
- Cement, influence of sugar upon, H. de B. Parsons (279), vol. 9 (1887-1888), p. 286
- Cement manufacture, symposium on (1383), vol. 34 (1912-1913), p. 1399
- Cement manufacture, topical discussion on (1331), vol. 33 (1911-1912), p. 717
- Cement mills, electric drive for, J. Benton Porter (1467), vol. 36 (1914-1915), p. 955
- Cement mills, power and heat distribution in, L. L. Griffiths (1311c), vol. 33 (1911-1912), p. 165
- Cement plant, conveying machinery in, C. J. Tomlinson (1193), vol. 30 (1908-1909), p. 213
- Cement, Portland, mechanical features of hydration of, and the making of concrete, Nathan C. Johnson (1486), vol. 37 (1915-1916), p. 237
- Cements, strength of, J. Sondericker and Gaetano Lanza (272), vol. 9 (1887-1888), p. 172
- Centrifugal fans, governors, pumps, etc. See fans, governors, pumps, etc.
- Centrifugal machines, operation of, Gustav Herrmann (548), vol. 14 (1892-1893), p. 1192
- Centrifugal stresses, increase of bore of high-speed wheels by, Sanford A. Moss (1370), vol. 34 (1912-1913), p. 895
- Charter for St. Louis, new, Edward Ladd (1451), vol. 36 (1914-1915), p. 571
- Chimney draft, De Volson Wood (401), vol. 11 (1889-1890), p. 974
- Chimney draft: facts and theories, R. H. Thurston (417), vol. 12 (1890-1891), p. 85
- Chimney draft, idiosyncrasies of, W. E. Crane (476), vol. 13 (1891-1892), p. 217
- Chimney draft, mechanical theory of, J. B. Webb (386), vol. 11 (1889-1890), p. 772
- Chimney draft, Peclet's treatment of, J. B. Webb (385), vol. 11 (1889-1890), p. 762
- Chimney draft, tests of recent formulae for, William Kent (502), vol. 11 (1889-1890), p. 984

- Chimney staging, F. G. Coggin (215), vol. 7 (1885-1886), p. 612
- Chimneys, boiler, dimensions of, for fuel oil, C. R. Weymouth (1361), vol. 34 (1912-1913), p. 639
- Chimneys, proportioning on a gas basis, A. L. Menzin (1518), vol. 37 (1915-1916), p. 1065
- Chimneys, table of sizes of, William Kent, (159), vol. 6 (1884-1885), p. 81
- Chimneys, theory and design of, Horace B. Gale (376), vol. 11 (1889-1890), p. 451
- Chronograph for engineering purposes, W. R. Eckart (66), vol. 3 (1882), p. 197
- Classification and catalogue system for engineering library, F. R. Hutton (686), vol. 17 (1895-1896), p. 422
- Classification and index, engineering, Wm. L. Chase (539), vol. 14 (1892-1893), p. 780
- Clankers of coal, Lionel S. Marks (1462), vol. 36 (1914-1915), p. 801
- Clutch couplings. See couplings.
- Clutches, Henry Souther (1188), vol. 30 (1908-1909), p. 39
- Coal and ore-handling machinery, dynamic braking for, Clark T. Henderson (1404), vol. 35 (1913-1914), p. 417
- Coal, anthracite, use of small sizes, E. B. Coke (557), vol. 15 (1893-1894), p. 36
- Coal calorimeter. See calorimeter.
- Coal, handling of, at the head of the Great Lakes, G. H. Hutchinson (1438), vol. 36 (1914-1915), p. 283
- Coal, Indiana block, tests of, at Chicago West Side Pumping Station, A. F. Nagle (47), vol. 13 (1891-1892), p. 131
- Coal, new method of stocking and reloading, James M. Dodge (277), vol. 9 (1887-1888), p. 270
- Coal, purchase of, Dwight T. Randall (1316), vol. 33 (1911-1912), p. 313
- Coals, American, classification and heating value of, William Kent (1433), vol. 36 (1914-1915), p. 189
- Coals, bituminous, evaporative power of, William Kent (115), vol. 4 (1882-1883), p. 249
- Coals, hygrometric properties of, R. C. Carpenter (741), vol. 18 (1896-1897), p. 938
- Coals, weathered, calorific power of, R. S. Hale (802), vol. 20 (1898-1899), p. 333
- Coast defense; coast and mechanical problems, Joseph Morgan, Jr. (254), vol. 8 (1886-1887), p. 582
- Coating, rustless, for iron and steel, M. P. Wood (598), vol. 15 (1893-1894), p. 998; (626), vol. 16 (1894-1895), p. 350; (637), vol. 16 (1894-1895), p. 663; (713), vol. 18 (1896-1897), p. 251
- Cold working sheet metal in dies, J. D. Riggs (941), vol. 23 (1901-1902), p. 547
- College and apprentice training, J. P. Jackson (1160), vol. 29 (1907-1908), p. 473
- Columns. See spruce columns.
- Combustion and boiler efficiency, Edw. A. Uehling (1298), vol. 32 (1910-1911), p. 1215
- Combustion, internal, control of, in gas engines, C. E. Lucke (1167), vol. 29 (1907-1908), p. 775
- Combustion, liquid fuel, Chas. E. Lucke (936), vol. 23 (1901-1902), p. 483
- Compensator, pyrometer, Wm. H. Bristol (1106), vol. 27 (1905-1906), p. 552
- Compressed air, note on, Frank Richards (584), vol. 15 (1893-1894), p. 685
- Compression, as a factor in steam engine economy, Frank H. Ball (545), vol. 14 (1892-1893), p. 1067
- Compression as method of governing steam engines, Harris Tabor (132), vol. 5 (1883-1884), p. 48
- Compression, governing steam engine by, John H. Barr (627), vol. 16 (1894-1895), p. 430
- Compressor, air, high duty, O. R. Hood (1131), vol. 28 (1906-1907), p. 705
- Compressor, air, hydraulic test of, W. O. Webber (894), vol. 22 (1900-1901), p. 599
- Compressors, air, duplex, improvement in valve motion of, S. H. Bunnell (1017), vol. 25 (1903-1904), p. 138
- Compressors, air, new volume regulator for, Ragnar Wikander (1460), vol. 36 (1914-1915), p. 759
- Compressors, air, valves for, F. W. Gordon (824), vol. 20 (1898-1899), p. 967
- Computers, some special forms of, F. A. Halsey (702), vol. 17 (1895-1896), p. 70
- Concrete and steel coal storage plant, F. M. Bowman (935), vol. 23 (1901-1902), p. 473
- Concrete beams, reinforced. See beams.
- Concrete, making of some mechanical features of the hydration of Portland cement, Nathan C. Johnson (1486), vol. 37 (1915-1916), p. 237
- Concrete, reinforced, applied to modern shop construction, E. N. Hunting (1102), vol. 27 (1905-1906), p. 373
- Concrete, reinforced, factory buildings. See factory.
- Condensation, cylinder, and the reduction by use of compound engine, Chas. R. Emery (249), vol. 8 (1886-1887), p. 479
- Condensation, cylinder, effect of steam jacket on, W. W. Bird (453), vol. 12 (1890-1891), p. 873
- Condensation, cylinder, laws of, Arthur L. Rice (742), vol. 18 (1896-1897), p. 950
- Condensation, surface, air in, Geo. A. Orrok (1363), vol. 34 (1912-1913), p. 713
- Condenser and cooling tower installation, J. H. Vail (798), vol. 20 (1898-1899), p. 157
- Condenser, self-cooling, L. R. Alberger (693), vol. 17 (1895-1896), p. 645
- Condenser, surface, C. F. Braun (1484), vol. 37 (1915-1916), p. 203
- Condenser, surface, evaporative, James H. Pitts (534), vol. 14 (1892-1893), p. 690
- Condensers, for steam turbines, George I. Rockwood (1072), vol. 26 (1904-1905), p. 383
- Condensers, surface, Jay M. Witham (291), vol. 9 (1887-1888), p. 417
- Condensers, surface, high vacuum, performance and design of, Geo. H. Gibson and Paul A. Bancel (1515), vol. 37 (1915-1916), p. 975
- Condensers, surface, proportioning of, Geo. A. Orrok (1544), vol. 38 (1916-1917), p. 467
- Condensers, vapor, automatic regulation of injection water to, James McBride (422), vol. 12 (1890-1891), p. 187
- Condensing water reservoirs, reduction in temperature of, due to cooling effect of air and evaporation, W. B. Ruggles (1357), vol. 34 (1912-1913), p. 561
- Conduits, apparatus for measuring and registering quantities of steam passing through, Franz Seiler (537), vol. 14 (1892-1893), p. 761
- Conduits, water, control of surges in, W. F. Durand (1353), vol. 34 (1912-1913), p. 319
- Cone pulleys, diameters of, C. A. Smith (320), vol. 10 (1888-1889), p. 269
- Confagurations, city, debarment of, Albert Blauvelt (1393a), vol. 35 (1913-1914), p. 171
- Conical pistons. See pistons.
- Conicograph, Andrew C. Campbell (231), vol. 8 (1888-1887), p. 145
- Connecting rod, influence upon engine forces, Sanford A. Moss (1071), vol. 26 (1904-1905), p. 367
- Connecting-rod end, new, Chas. Wallace Hunt (888), vol. 22 (1900-1901), p. 531
- Connecting rods, W. F. Mattes (295), vol. 9 (1887-1888), p. 466
- Conservation idea as applied to Am. Soc. M. E., M. L. Holman (1208), vol. 30 (1908-1909), p. 577
- Construction, at Atlantic Ave. Station of the Edison Elec. Ilg. Co. of Boston, I. E. Moulthrop and R. E. Curtis (942), vol. 23 (1901-1902), p. 569
- Contracts, construction writing of, R. P. Bolton (871), vol. 22 (1900-1901), p. 91
- Conveying and hoisting machinery, G. E. Titcomb (1190), vol. 30 (1908-1909), p. 123

- Conveying and hoisting, report on (1403), vol. 35 (1913-1914), p. 405
- Conveying machinery in a cement plant, C. J. Tomlinson (1193), vol. 30 (1908-1909), p. 213
- Conveying of materials, continuous, S. B. Peck (1191), vol. 30 (1908-1909), p. 155
- Conveying of materials, discussion on the (1195), vol. 30 (1908-1909), p. 233
- Conveying, systems: cotton, their safeguards against fire, H. A. Burnham (1406), vol. 35 (1913-1914), p. 513
- Conveyor, belt, C. Kemble Baldwin (1192), vol. 30 (1908-1909), p. 187
- Conveyor, belt, Ellis C. Soper (1234), vol. 31 (1909-1910), p. 151
- Conveyors, belt, performance of, E. J. Haddock (1194), vol. 30 (1908-1909), p. 217
- Conveyors, grain, belts as, T. W. Hugo (171), vol. 6 (1884-1885), p. 400
- Cooling tower and condenser installation, J. H. Vail (798), vol. 20 (1898-1899), p. 157
- Cooling towers for steam and gas power plants, J. R. Bibbins (1259), vol. 31 (1909-1910), p. 725
- Core room: its equipment and management, Henry M. Lane (1332), vol. 33 (1911-1912), p. 735
- Corlias engine. See engine.
- Corrosion and scale, prevention of, in boilers, Allen H. Babcock (1520), vol. 37 (1915-1916), p. 1105
- Corrosion of cast-steel propeller blade, notes on, F. B. King (505), vol. 15 (1893-1894), p. 961
- Corrosion of steam drums, James McBride (600), vol. 15 (1893-1894), p. 1087
- Cost accounting, textile mills, C. B. Annet and C. F. Cunningham (1408), vol. 35 (1913-1914), p. 555
- Cost and time, short way to keep, H. L. Binsse (287), vol. 9 (1887-1888), p. 380
- Cost-keeping system, H. M. Norris (767), vol. 19 (1897-1898), p. 387
- Cost of an indicated horse power, DeCourcy May (603), vol. 15 (1893-1894), p. 1146
- Cost of foundry work, estimating, Geo. L. Fowler (288), vol. 9 (1887-1888), p. 390
- Cost of heating of store houses, H. O. Lacount (1146), vol. 29 (1907-1908), p. 159
- Cost of power in non-condensing steam engines, Chas. E. Emery (319), vol. 10 (1888-1889), p. 233
- Cost of steam and water power, Chas. H. Manning (332), vol. 10 (1888-1889), p. 499
- Cost of steam power, reduction in, F. W. Dean (764), vol. 19 (1897-1898), p. 301
- Cost of upkeep of horse-drawn vehicles compared with electric vehicles, W. R. Metz (1391), vol. 35 (1913-1914), p. 129
- Costs and production, relation between, H. L. Gantt (1479), vol. 37 (1915-1916), p. 109
- Costs, manufacturing, Henry R. Towne (1377), vol. 34 (1912-1913), p. 1111
- Costs, power-plant operating, standardization of, Walter N. Polakov (1549), vol. 38 (1916-1917), p. 681
- Cotton ginning and baling from 1798 to 1898, Geo. A. Lowry (785), vol. 19 (1897-1898), p. 811
- Cotton, method of preparing and baling, in round bales of uniform lap, J. R. Fordyce (891), vol. 22 (1900-1901), p. 551
- Cotton mills, electricity in, W. B. Smith Whaley (951), vol. 23 (1901-1902), p. 769
- Counterbalance in locomotive drive wheels, W. F. M. Goss (625), vol. 16 (1894-1895), p. 305
- Counterbalancing of engines and other machinery having reciprocating parts, S. W. Robinson, (40), vol. 2 (1881), p. 249
- Counterbalancing reciprocating parts of a locomotive, Gaetano Lanza (321), vol. 10 (1888-1889), p. 302
- Coupling, clutch, friction, experimental analysis of, Wm. T. Magruder (1237), vol. 32 (1910-1911), p. 549
- Couplings, clutch, mechanism for maneuvering, W. F. Durfee (119), vol. 4 (1882-1883), p. 311
- Couplings, hose, standard threads for (1398), vol. 35 (1913-1914), p. 301
- Crane, 200-ft. gantry, John W. Seaver (709), vol. 18 (1896-1897), p. 145
- Crane chains, experiences with, C. S. Dutton (398), vol. 11 (1889-1890), p. 952
- Crane, power, W. F. Durfee (137), vol. 5 (1883-1884), p. 131
- Crane, travelling overhead, performance of, operated by single electric motor, A. Victoria (520), vol. 14 (1892-1893), p. 368
- Crane wheels, chilled iron, standardization of, F. K. Vial (1465), vol. 36 (1914-1915), p. 873
- Cranes, Bessemer ingot, ordinary form of, Gram Curtis (114), vol. 4 (1882-1883), p. 239
- Cranes, code of safety standards for (1572), vol. 38 (1916-1917), p. 1205
- Cranes, travelling, hydraulic, Erwin Graves (424), vol. 12 (1890-1891), p. 202
- Cranes, types and details, Henry R. Towne (118), vol. 4 (1882-1883), p. 288
- Crank, efficiency of, S. W. Robinson (14), vol. 1 (1880), p. 218
- Crankpin, putting on new, of S. S. Knickerbocker, Lewis Johnson (6), vol. 1 (1880), p. 70
- Crankpins, method of securing, C. C. Collins (293), vol. 9 (1897-1898), p. 446
- Crankshaft, new method of constructing, John E. Sweet (111), vol. 4 (1882-1883), p. 231
- Crankshafts and bearings, production of, H. See (211), vol. 7 (1885-1886), p. 521
- Cross-sections and symbols, standard, report of committee on (1468), vol. 36 (1914-1915), p. 965
- Cross-sections, standard, H. de B. Parsons (1327), vol. 33 (1911-1912), p. 561
- Crushers, Edison roll, W. H. Mason (1311b), vol. 33 (1911-1912), p. 134
- Cupolas and forges, centrifugal fans for, Wm. Sangster (880), vol. 22 (1900-1901), p. 354
- Curve delineator, F. A. Scheffer (560), vol. 15 (1893-1894), p. 67
- Cut-off, adjustable, for marine engines, H. S. Hayward (95), vol. 4 (1882-1883), p. 136
- Cut-off and throttling regulation, comparison of, with automatic variable cut-off on compound and triple-expansion engines, Chas. T. Porter (615), vol. 16 (1894-1895), p. 111
- Cut-off in steam engines, Alfred R. Wolf and J. E. Denton (33), vol. 2 (1881), p. 150 first paper
- Cut-off in steam engines, Alfred R. Wolf and J. E. Denton (35), vol. 2 (1881), p. 288 second paper
- Cutters, rotary, experimental investigation of cutting of bevel gears with, Forrest R. Jones and A. L. Goddard (703), vol. 17 (1895-1896), p. 75
- Cutting metals, art of, F. W. Taylor (1119), vol. 28 (1906-1907), p. 31
- Cylinder condensation. See condensation.
- Cylinder performance of reciprocating engines, new analysis of, J. Paul Clayton (1347), vol. 34 (1912-1913), p. 17
- Cylinder proportions for compound and triple-expansion engines, B. C. Ball (862), vol. 21 (1899-1900), p. 1002
- Cylinder proportions for compound engines determined by their free expansion losses, F. H. Ball (589), vol. 15 (1893-1894), p. 759
- Cylinder ratios of triple-expansion engines, Jay M. Whitham (338), vol. 10 (1888-1889), p. 576
- Cylinder, repairing a broken, H. M. Lane (938), vol. 23 (1901-1902), p. 520
- Cylinders, areas of, compound engines and regulation of pressure in receiver, Chas. T. Main (313), vol. 10 (1888-1889), p. 48
- Cylinders, cast iron, experiments on, C. H. Benjamin (776), vol. 19 (1897-1898), p. 597
- Cylinders for compound engines, method of proportioning, E. C. Knapp (643), vol. 16 (1894-1895), p. 762
- Cylinders in single-acting engines, offsetting, T. M. Phetteplace (1240), vol. 31 (1909-1910), p. 223
- Cylinders, operation of parallel and radial axes of a locomotive by a single set of, Anatole

- Mallet (1502), vol. 37 (1915-1916), p. 653
 Cylinders, pump, study of proper method of determining strength of, C. W. Kettell (682), vol. 17 (1895-1896), p. 372
 Cylinders, steam, friction of piston packing rings in, J. E. Denton (327), vol. 10 (1888-1889), p. 392
 Cylinders, steam, proportioning, R. H. Thurston (284), vol. 9 (1887-1888), p. 360
 Cylinders, steel tubes, and pipes, strength of, under internal fluid pressure, Reid T. Stewart (1352), vol. 34 (1912-1913), p. 297
 Cylindrical work, efficient production of, C. H. Norton (1369), vol. 34 (1912-1913), p. 883

D

- DeLaval steam turbine. See turbine.
 Design and mechanical features of California gold dredge, Robert E. Cranston (1348), vol. 34 (1912-1913), p. 119
 Design, forge shop, data relating to, P. M. Chamberlain (876), vol. 17 (1895-1896), p. 219
 Development of our fleet and naval stations, W. L. Cathcart (1570), vol. 38 (1916-1917), p. 1157
 Dies, cold working sheet metal in, J. D. Riggs (941), vol. 23 (1901-1902), p. 548
 Diesel engine. See engine.
 Disinfecting plant, modern, W. H. Francis (562), vol. 15 (1893-1894), p. 101
 Disinfecting plant, portable, W. H. Francis (635), vol. 16 (1894-1895), p. 655
 Disk friction. See friction.
 Displacements and area curves of fish, H. deB. Parsons (307), vol. 9 (1887-1888), p. 679
 Distilling apparatus of high efficiency, W. F. M. Goss (1019), vol. 25 (1903-1904), p. 160
 Drafting room and shop systems, Frederick O. Ball (909), vol. 22 (1900-1901), p. 1040
 Drainage machinery of the Netherlands, A. Huet (531), vol. 14 (1892-1893), p. 635
 Drawing boards, improvement in, Theodore Bergner (166), vol. 6 (1884-1885), p. 224
 Drawing office appliances, A. W. Robinson (614), vol. 16 (1894-1895), p. 106
 Drawing office equipment, John McGeorge (998), vol. 24 (1902-1903), p. 1254
 Drawing office to shop in manufacturing, relation of, A. W. Robinson (596), vol. 15 (1893-1894), p. 965
 Drawing office, rules for, A. W. Robinson (910), vol. 22 (1900-1901), p. 1077
 Drawing office system, Henry R. Towne (143), vol. 5 (1883-1884), p. 193
 Drawings and patterns, indexing, Albert F. Hall (48), vol. 2 (1881), p. 378
 Dredging machinery, recent improvements in, A. Wells Robinson (229), vol. 8 (1886-1887), p. 114
 Drill, Vauclain, A. C. Vauclain and Henry V. Wille (1368), vol. 34 (1912-1913), p. 867
 Drills, twist, W. H. Thorne (190), vol. 7 (1885-1886), p. 130
 Drop press, modern, C. E. Billings (664), vol. 17 (1895-1896), p. 31
 Drop press, pressure obtainable by use of, R. H. Thurston (133), vol. 5 (1883-1884), p. 53
 Duodecimal system, metric system versus, Geo. W. Colles (721), vol. 18 (1896-1897), p. 492
 Dust produced in workshops, R. Kohfahl (535), vol. 14 (1892-1893), p. 696
 Dynamic engineer, training of, C. M. Woodward (221), vol. 7 (1885-1886), p. 742
 Dynamo, Edison, description of, T. A. Edison and C. T. Porter (71), vol. 3 (1882), p. 233
 Dynamograph, metal, P. M. Chamberlain (846), vol. 21 (1899-1900), p. 578
 Dynamometer, automatic absorption, G. I. Alden (399), vol. 11 (1889-1890), p. 958
 Dynamometer, balance, new form of, S. S. Webber and W. O. Webber (110), vol. 4 (1882-1883), p. 227
 Dynamometer, belt, S. P. Watt (442), vol. 12 (1890-1891), p. 694

- Dynamometer, hydraulic, Jas. D. Hoffman (688), vol. 17 (1895-1896), p. 471
 Dynamometer, improved absorption, C. M. Garland (1288), vol. 32 (1910-1911), p. 571
 Dynamometer, lathe-tool, experiments with, J. T. Nicolson (1035), vol. 25 (1903-1904), p. 637
 Dynamometer, new form of transmission, Fred'k Bedell (726), vol. 18 (1896-1897), p. 669
 Dynamometer, spring, mechanical integrator used in connection with, M. H. Wickhorst (870), vol. 22 (1900-1901), p. 83
 Dynamometer, transmission, W. F. Durand (1130), vol. 28 (1906-1907), p. 697
 Dynamometer, transmission, W. H. Kenerson (1236), vol. 31 (1909-1910), p. 171
 Dynamometer, transmitting, comparative loss by friction in a, under different loads and speeds, Samuel Webber (334), vol. 10 (1888-1889), p. 514
 Dynamometer, twist-drill, W. W. Bird and Howard P. Fairfield (1070), vol. 26 (1904-1905), p. 355
 Dynamometer, valve, for measuring power required to move slide valve at different speeds and pressures, C. M. Giddings (217), vol. 7 (1885-1886), p. 631
 Dynamometric testing, use of indicator for continuous records in, W. S. Aldrich (563), vol. 15 (1893-1894), p. 112
 Dynamos and engines, appendix to report of committee on standardization of (1056), vol. 26 (1904-1905), p. 67
 Dynamos and engines, final report of committee on standardization of (916), vol. 23 (1901-1902), p. 99

E

- Eccentric, unbalanced effect on valve motion of shaft-governed engines, John E. Sweet (407), vol. 11 (1889-1890), p. 1063
 Education, industrial, W. B. Russell (1181), vol. 29 (1907-1908), p. 1121
 Education in engineering, D. S. Jacobus (1543), vol. 38 (1916-1917), p. 453
 Education of intuition in machine designing, John T. Hawkins (247), vol. 8 (1886-1887), p. 458
 Education of machinists, foremen and mechanical engineers, M. P. Higgins (850), vol. 21 (1899-1900), p. 846
 Education of machinists, foremen and mechanical engineers, M. P. Higgins (864), vol. 21 (1899-1900), p. 1114
 Education, technical, E. B. Coxe (582), vol. 15 (1893-1894), p. 655
 Education, technical efficiency in, a factor in the development of professional ideals, W. F. M. Goss (1397), vol. 35 (1913-1914), p. 291
 Education, technical, in United States, R. H. Thurston (543), vol. 14 (1892-1893), p. 855
 Efficiency, measuring, H. L. Gantt (1444), vol. 36 (1914-1915), p. 417
 Electric control, automatic, for machine tools, L. C. Brooks (1522), vol. 37 (1915-1916), p. 1183
 Electric drive in cement mills, J. Benton Porter (1467), vol. 36 (1914-1915), p. 955
 Electric drive in machine shop, economy of, A. L. DeLeeuw (1276a), vol. 32 (1910-1911), p. 137
 Electric drive versus shaft-drive in machine shop, C. H. Benjamin (738), vol. 18 (1896-1897), p. 861
 Electric driving in machine shops, mechanical features of, John Riddell (1276c), vol. 32 (1910-1911), p. 219
 Electric light and electric railway central station, D. C. Jackson and A. W. Richter (657), vol. 16 (1894-1895), p. 1142
 Electric lighting in steel passenger cars, Currie (1388a), vol. 35 (1913-1914), p. 597

- Electric lighting rules, report of meeting of National Conference on standard (977), vol. 24 (1902-1903), p. 885
- Electric locomotives. See locomotives.
- Electric motor appliances, economic features of, Charles Robbins (12766), vol. 32 (1910-1911), p. 165
- Electric plant, Cleveland municipal, design and operation of, Frederick W. Ballard (1456), vol. 36 (1914-1915), p. 649
- Electric plant, oil burning, fuel economy tests at, C. R. Weymouth (1213), vol. 30 (1908-1909), p. 775
- Electric power, method for determining rates and prices for, F. B. Perry (1016), vol. 25 (1903-1904), p. 120
- Electric power plants, rating upon the heat unit standard, W. S. Aldrich (732), vol. 18 (1896-1897), p. 721
- Electric power for textile mills, relative value of private and purchased, Frank W. Reynolds and Dan Adams (1497), vol. 37 (1915-1916), p. 565
- Electric railway as applied to steam roads, B. J. Dashiell, Jr. (485), vol. 13 (1891-1892), p. 359
- Electric railway plant, tests of small, Jesse M. Smith (586), vol. 15 (1893-1894), p. 730
- Electric tramways, present and prospective development of, C. J. Field (630), vol. 16 (1894-1895), p. 504
- Electric transmission, systems and efficiency of, in factories and mills, W. S. Aldrich (859), vol. 21 (1899-1900), p. 912
- Electric welding. See welding.
- Electrical equipment on steel motor cars, F. W. Butt (1388), vol. 35 (1913-1914), p. 63
- Electrically propelled suburban trains, cost of, H. M. Hobart (12936), vol. 32 (1910-1911), p. 879
- Electricity in cotton mills, W. B. Smith Whaley (770), vol. 19 (1897-1898), p. 467
- Electricity in cotton mills, W. B. Smith Whaley (951), vol. 23 (1901-1902), p. 769
- Electricity in manufacturing work, Wm. S. Aldrich (908), vol. 22 (1900-1901), p. 1003
- Electricity, working railroads by, W. E. Hall (390), vol. 11 (1889-1890), p. 839
- Electrification of railways, George Westinghouse (1293), vol. 32 (1910-1911), p. 945
- Electrification of suburban railways, F. W. Carter (1293a), vol. 32 (1910-1911), p. 853
- Electrification of trunk lines, L. R. Pomeroy (1293c), vol. 32 (1910-1911), p. 927
- Electrification, railway, economics of, Wm. B. Potter (1293c), vol. 32 (1910-1911), p. 907
- Electrochemical treatment, anti-rust coatings for iron and steel, galvanizing, M. P. Wood (626), vol. 16 (1894-1895), p. 350
- Elevated tanks. See tanks.
- Elevator, high speed, C. R. Pratt (1161), vol. 29 (1907-1908), p. 531
- Elevator, plunger, G. I. Alden (813), vol. 20 (1898-1899), p. 629
- Elevator safeties, C. R. Pratt (904), vol. 23 (1901-1902), p. 536
- Elevator system, hydraulic, test of, R. P. Bolton (981), vol. 24 (1902-1903), p. 933
- Elevators, C. R. Pratt (820), vol. 20 (1898-1899), p. 804
- Elevators, modern electric, and elevator problems, David Lindquist (1504), vol. 37 (1915-1916), p. 705
- Elevators, passenger, operating conditions of, R. P. Bolton (1300), vol. 32 (1910-1911), p. 1295
- Emery wheels, bursting of, C. H. Benjamin (983), vol. 24 (1902-1903), p. 963
- Empirical equations, forms of, and model experiments, E. Buckingham (1487), vol. 37 (1915-1916), p. 263
- Enameling, the art of, or the coating of steel and iron with glass, Raymond F. Nailler (1414), vol. 35 (1913-1914), p. 773
- Encyclopedia Britannica, error in, J. B. Webb (352), vol. 10 (1888-1889), p. 778
- Engine, American central-valve, E. T. Adams (883), vol. 22 (1900-1901), p. 426
- Engine, blowing, blast-furnace, F. W. Gordon (441), vol. 12 (1890-1891), p. 676
- Engine, commercial gas, testing, and proposed standard of comparison, Wm. P. Flint (1031), vol. 25 (1903-1904), p. 509
- Engine, compound, designing of, and probable limit of steam pressure in marine engines and boilers, Chas. E. Emery (248), vol. 8 (1886-1887), p. 472
- Engine, compound, tests of, using superheated steam, D. S. Jacobus (1024), vol. 25 (1903-1904), p. 264
- Engine, compound, for manufacturing purposes, areas of cylinders and regulation of pressure in receiver, Chas. T. Main (313), vol. 10 (1887-1888), p. 48
- Engine, compound, its use to reduce cylinder condensation, Chas. E. Emery (249), vol. 8 (1886-1887), p. 479
- Engine, compound, performance of, Geo. H. Barrus (303), vol. 9 (1887-1888), p. 545
- Engine, compound steam, best load for, A. K. Mansfield (727), vol. 18 (1896-1897), p. 674
- Engine compound, water and heat consumption of at various powers, D. S. Jacobus (999), vol. 24 (1902-1903), p. 1274
- Engine, construction and efficiency of a Fleming 4-valve, direct-connected to a 400-kw. generator Benj. T. Allen (1022), vol. 25 (1903-1904), p. 212
- Engine construction, built-up work in, Horace See (67), vol. 3 (1882), p. 209
- Engine, Corliss, alteration to crosshead of, Chas. E. Emery (22), vol. 2 (1881), p. 40
- Engine, Diesel, its applications in Southern California, Walter H. Adams (1492), vol. 37 (1915-1916), p. 413
- Engine, economy of a 1000-kw. natural gas, E. D. Dreyfus and V. J. Hultquist (1338), vol. 33 (1911-1912), p. 939
- Engine, effect of varying the weight (amount of metal in) of regenerator in a hot-air, G. W. Bissell (587), vol. 15 (1893-1894), p. 744
- Engine, first stationary steam, in America, F. R. Hutton (597), vol. 15 (1893-1894), p. 982
- Engine, gas, compact; beam type, C. H. Morgan (1023), vol. 25 (1903-1904), p. 245
- Engine, gas, efficiency of, as modified by point of ignition, C. V. Kerr (875), vol. 22 (1900-1901), p. 152
- Engine, gas, efficiency test of a 125 horse-power, C. H. Robertson (843), vol. 21 (1899-1900), p. 396
- Engine, gas, efficiency tests of a 125-horsepower, C. H. Robertson (895), vol. 22 (1900-1901), p. 612
- Engine, gas, first large installation in American Steel Works, E. P. Coleman (1302), vol. 32 (1910-1911), p. 1361
- Engine, gas, large, present status of in Europe, P. Langer (1419), vol. 35 (1913-1914), p. 847
- Engine, gas, new principle in design of, C. E. Sargent (879), vol. 22 (1900-1901), p. 312
- Engine, gas or oil, new graphical method of constructing entropy-temperature diagram of, from its indicator card, Henry T. Eddy (836), vol. 21 (1899-1900), p. 275
- Engine, gas, working details of a test, R. H. Fernald (950), vol. 23 (1901-1902), p. 704
- Engine governor, apparatus for obtaining continuous record of position of, Jos. C. Riley (955), vol. 24 (1902-1903), p. 78
- Engine, heat problem, Chas. E. Luce (923), vol. 23 (1901-1902), p. 202
- Engine, heavy oil, its present status and future development, A. H. Goldingham (1493), vol. 37 (1915-1916), p. 477
- Engine-house practice, F. H. Clark (1290), vol. 32 (1910-1911), p. 677
- Engine, internal-combustion, evolution of, S. A. Reeve (1168), vol. 29 (1907-1908), p. 803
- Engine, internal-combustion, investigation of as applied to traction engines, A. A. Potter and

- W. A. Buck (1563), vol. 38 (1916-1917), p. 995
- Engine, internal-combustion, performance of, using kerosene and gasoline as fuel, H. F. Halladay and G. O. Hodge (990), vol. 24 (1902-1903), p. 1065
- Engine, multi-cylinder or compound, its theory and limitations, R. H. Thurston (362), vol. 11 (1889-1890), p. 135
- Engine, of the steamer City of Richmond, indicating of (388), vol. 11 (1889-1890), p. 828
- Engine, oil, test of an 85-H. P., Forrest M. Tow (13366), vol. 33 (1911-1912), p. 905
- Engine, oil, vaporizer proportions, Louis Illmer (1509), vol. 37 (1915-1916), p. 845
- Engine, power required to overcome frictional resistance of, and shafting in mills, J. T. Henthorn (174), vol. 6 (1884-1885), p. 461
- Engine proportions, current practice in, John H. Barr (743), vol. 18 (1896-1897), p. 737
- Engine, pumping (Brooklyn), of 1860, Samuel McElroy (469), vol. 13 (1891-1892), p. 83
- Engine pumping, changing the suction system of, F. W. Dean (607), vol. 16 (1894-1895), p. 40
- Engine, pumping, high-duty, test of fifteen-million gal., at Grand Rapids, Mich., M. E. Cooley, J. R. Allen and F. C. Wagner (863), vol. 21 (1889-1900), p. 1018
- Engine, pumping, Pawtucket, influence of steam jackets of, William Kent (473), vol. 13 (1891-1892), p. 176
- Engine, pumping, Pawtucket, influence of steam jackets of, D. S. Jacobus (406), vol. 11 (1889-1890), p. 1038
- Engine, pumping, Pawtucket, influence of steam jackets on, J. E. Denton (374), vol. 11 (1889-1890), p. 328
- Engine, pumping, test, with superheated steam, E. H. Foster (853), vol. 21 (1899-1900), p. 788
- Engine, pumping, Worthington, performance of, against a head equivalent to 2000 ft. of water, J. E. Denton (460), vol. 12 (1890-1891), p. 975
- Engine, reciprocating, starting of compared with steam turbine, A. S. Mann (1080), vol. 26 (1904-1905), p. 524
- Engine, regulation of and proper method of expansion of steam, R. H. Thurston (45), vol. 2 (1881), p. 346
- Engine, results of experiments with 50-horsepower single non-condensing Ball and Wood engine, to determine influence of compression on water consumption, D. S. Jacobus (593), vol. 15 (1893-1894), p. 915
- Engine-room experience, L. F. Lyne (347), vol. 10 (1888-1889), p. 696
- Engine, single-acting compound, steam distribution in a form of, F. M. Rites (495), vol. 13 (1891-1892), p. 557
- Engine, single-acting compound, W. A. Bole (429), vol. 12 (1890-1891), p. 275
- Engine, Snow pumping, test of, at the Riverside Station of Indianapolis Water Company, W. F. M. Goss (854), vol. 21 (1899-1900), p. 793
- Engine speed, internal friction, and variable load, R. H. Thurston (317), vol. 10 (1888-1889), p. 138
- Engine speed, limitation of, Chas. T. Porter (540), vol. 14 (1892-1893), p. 806
- Engine, steam, at the end of the 19th century, R. H. Thurston (832), vol. 21 (1899-1900), p. 181
- Engine, steam, economy and efficiency of, C. H. Peabody (484), vol. 13 (1891-1892), p. 337
- Engine, steam, economy, compression as a factor in, Frank H. Ball (545), vol. 14 (1892-1893), p. 1067
- Engine, steam, efficiencies of and conditions of maximum economy, R. H. Thurston (74), vol. 3 (1882), p. 262
- Engine, steam, experiment on effect of clearance on economy of a small, Albert Kingsbury (922), vol. 23 (1901-1902), p. 186
- Engine, steam, experimental determination of effect of water in steam on economy of, R. C. Carpenter and L. S. Marks (573), vol. 15 (1893-1894), p. 438
- Engine, steam, high-pressure multiple-expansion, maximum contemporary economy of, R. H. Thurston (572), vol. 14 (1893-1894), p. 313
- Engine, steam, Hirn and Dwellshauer's theory of, R. H. Thurston (382), vol. 11 (1889-1890), p. 688
- Engine, steam, limitations of economy, A. F. Nagle (468), vol. 13 (1891-1892), p. 77
- Engine, steam, practical methods for greater economy of fuel in, Allan Stirling (18), vol. 1 (1880), p. 261
- Engine, steam, tests at the Massachusetts Institute of Technology, C. H. Peabody (200), vol. 7 (1885-1886), p. 328
- Engine, steam, transmission of force in, influenced by action of friction, acceleration and gravity, D. S. Jacobus (377), vol. 11 (1889-1890), p. 492
- Engine, testing, applications of Hirn's analysis to, R. C. Carpenter (451), vol. 12 (1890-1891), p. 790
- Engine tests, discussion on preliminary forms of report of committee on standardizing (974), vol. 24 (1902-1903), p. 791
- Engine, tests of a direct-connected 8-ft. fan and, E. S. Farwell (1018), vol. 23 (1903-1904), p. 145
- Engine, tests made on experimental, of Sibley College, R. C. Carpenter (649), vol. 16 (1894-1895), p. 913
- Engine tests, plea for standard method of conducting, Geo. H. Barrus (781), vol. 19 (1897-1898), p. 713
- Engine tests, steam, extension of standard uniform methods of conducting and reporting, Bryan Donkin (786), vol. 19 (1897-1898), p. 827
- Engine, trial of Leavitt pumping, F. W. Dean (619), vol. 16 (1894-1895), p. 169
- Engine, trials of recent compound, with cylinder ratio of 7:1, F. W. Dean (620), vol. 16 (1894-1895), p. 179
- Engine, triple-expansion pumping, performance of with and without jackets, J. E. Denton (553), vol. 14 (1892-1893), p. 1340
- Engine, triple-expansion, test of, J. T. Henthorn (440), vol. 12 (1890-1891), p. 643
- Engine, triple, tests of, at Massachusetts Institute of Technology, C. H. Peabody and E. F. Miller (521), vol. 14 (1892-1893), p. 381
- Engine, triple, tests on, at the Massachusetts Institute of Technology, C. H. Peabody and E. F. Miller (612), vol. 16 (1894-1895), p. 82
- Engine, 12-hp. gas, test of, C. H. Robertson (991), vol. 24 (1902-1903), p. 1097
- Engine valve gear, Buckeye, A. K. Mansfield (567), vol. 15 (1893-1894), p. 177
- Engine, vertical triple-expansion condensing pumping, trial of, at Trenton Water Works, Samuel Webber and S. S. Webber (608), vol. 16 (1894-1895), p. 49
- Engine, water consumption of an unjacketed 1600 horsepower compound Harris-Corliss, J. E. Denton, D. S. Jacobus, R. H. Rice (591), vol. 15 (1893-1894), p. 882
- Engines and dynamos, appendix to report of committee on standardization of (1056), vol. 26 (1904-1905), p. 67
- Engines and dynamos, final report of committee on standardization of (916), vol. 23 (1901-1902), p. 99
- Engines and machinery at the World's Fair of 1893, physical tests of (503), vol. 14 (1892-1893), p. 41
- Engines and other machinery having reciprocating parts, counterbalancing of, S. W. Robinson (40), vol. 2 (1881), p. 249
- Engines, automobile, air cooling of, John Wilkinson (1147), vol. 29 (1907-1908), p. 203
- Engines, auxiliary, and transmission of power on naval vessels, G. W. Dickie (762), vol. 19 (1897-1898), p. 233
- Engines, balanced vertical, W. F. Durfee (125), vol. 4 (1882-1883), p. 368

- Engines, blowing, blast-furnace, reciprocating, W. Trinks (1321), vol. 33 (1911-1912), p. 427
- Engines, comparisons between different types of, Chas. A. Hague (41), vol. 2 (1881), p. 204
- Engines, compound and single-cylinder Corliss condensing, comparison of economy of, D. S. Jacobus (458), vol. 12 (1890-1891), p. 943
- Engines, compound and triple-expansion, Chas. T. Porter (615), vol. 16 (1894-1895), p. 111
- Engines, compound and triple-expansion, cylinder proportions for, B. C. Ball (862), vol. 21 (1899-1900), p. 1002
- Engines, compound, determined by their free expansion losses, cylinder proportions for, F. H. Ball (589), vol. 15 (1893-1894), p. 759
- Engines, compound, indicator rigging for, Fred W. Parsons (367), vol. 11 (1889-1890), p. 222
- Engines, compound, method of proportioning cylinders for, E. C. Knapp (643), vol. 16 (1894-1895), p. 762
- Engines, compound, of large size, use of superheated steam and of reheaters in, L. S. Marks (1030), vol. 25 (1903-1904), p. 443
- Engines, compound, pumping thermodynamics of certain forms of Worthington and other, S. W. Robinson (64), vol. 3 (1882), p. 141
- Engines, Corliss, positive governor drives for, A. H. Eldredge (995), vol. 24 (1902-1903), p. 1151
- Engines, counterweights for, D. S. Jacobus (1081), vol. 26 (1904-1905), p. 529
- Engines, cushion adjustment in, S. W. Robinson (17), vol. 1 (1880), p. 252
- Engines, description of cam for actuating the valves of high-speed steam, Chas. T. Porter (616), vol. 16 (1894-1895), p. 117
- Engines, distribution of, internal friction of, R. H. Thurston (316), vol. 10 (1888-1889), p. 110
- Engines for use of highly superheated steam, Max E. R. Toltz (1179), vol. 29 (1907-1908), p. 1069
- Engines, forces, influence of connecting rod upon, Sanford A. Moss (1071), vol. 27 (1904-1905), p. 367
- Engines, gas and oil, horsepower, friction losses and efficiencies of, L. S. Marks (1202), vol. 30 (1908-1909), p. 423
- Engines, gas, control of combustion in, C. E. Lucke (1167), vol. 29 (1907-1908), p. 775
- Engines, gas, for driving alternating current generators, H. G. Reist (1281), vol. 32 (1910-1911), p. 363
- Engines, gas, method of testing, E. C. Oliver (989), vol. 24 (1902-1903), p. 1050
- Engines, gas, practical operation of, with blast-furnace gas as fuel, Charles C. Sampson (1392), vol. 35 (1913-1914), p. 151
- Engines, gas, steam and air, a new valve gear for, E. W. Naylor (920), vol. 23 (1901-1902), p. 151
- Engines, gasoline, design constants for, William D. Ennis (1337), vol. 33 (1911-1912), p. 927
- Engines, governing rolling mill, W. P. Caine (1260), vol. 31 (1909-1910), p. 783
- Engines, handling, H. H. Vaughan (1290), vol. 32 (1910-1911), p. 699
- Engines, high-speed, effect of steam jackets on, R. C. Carpenter (523), vol. 14 (1892-1893), p. 426
- Engines, high-speed, formulae and tables for calculating the effect of reciprocating parts of, Geo. I. Alden (234), vol. 8 (1886-1887), p. 191
- Engines, high-speed, proportions of, John H. Barr, F. F. Gaines, H. E. Williams (670), vol. 17 (1895-1896), p. 117
- Engines, improved indicator cock for, A. K. Mansfield (937), vol. 23 (1901-1902), p. 511
- Engines, marine, adjustable cut-off for, H. S. Hayward (95), vol. 4 (1882-1883), p. 136
- Engines, marine, and boilers, probable limit of steam pressure in, Chas. E. Emery (248), vol. 8 (1886-1887), p. 472
- Engines, marine, on the Lakes, and a device for getting them off the dead centers, J. F. Hallaway (107), vol. 4 (1882-1883), p. 211
- Engines, marine, Stevens valve gear for, Andrew Fletcher (789), vol. 19 (1897-1898), p. 449
- Engines, multiple-cylinder, reheaters in, R. H. Thurston (858), vol. 21 (1899-1900), p. 893
- Engines, multiple-cylinder steam, effects of variation of proportions and variable loads, R. H. Thurston and L. L. Brinsmade (760), vol. 19 (1897-1898), p. 152
- Engines, multiple-expansion, application of Hirn's analysis to, C. H. Peabody (448), vol. 12 (1890-1891), p. 740
- Engines, non-condensing, friction of, R. H. Thurston (228), vol. 8 (1886-1887), p. 86
- Engines, non-condensing, internal friction of, R. H. Thurston (265), vol. 9 (1887-1888), p. 74
- Engines, non-condensing, losses in, James B. Stanwood (1062), vol. 26 (1904-1905), p. 190
- Engines, non-condensing steam, cost of power, Chas. E. Emery (319), vol. 10 (1888-1889), p. 233
- Engines, oil, H. R. Setz (1336a), vol. 33 (1911-1912), p. 857
- Engines, pumping, balancing of, A. F. Nagle (1144), vol. 29 (1907-1908), p. 131
- Engines, pumping, discussion of report on standard method of conducting duty trials of (437), vol. 12 (1890-1891), p. 563
- Engines, pumping, duty trials of, J. S. Coon (297), vol. 9 (1887-1888), p. 476
- Engines, pumping, report of committee on standard method of conducting duty trials of (381), vol. 11 (1889-1890), p. 654; (381), vol. 12 (1890-1891), p. 530
- Engines, pumping, specifications for, A. F. Hall (601), vol. 15 (1893-1894), p. 1103
- Engines, pumping, test of two ten-million gallon, at the Baden Pumping Station, J. A. Laird (840), vol. 21 (1899-1900), p. 327
- Engines, reciprocating, new analysis of cylinder performance of, J. Paul Clayton (1347), vol. 34 (1912-1913), p. 17
- Engines, several types of, tests under conditions in actual practice, R. C. Carpenter (384), vol. 11 (1889-1890), p. 723
- Engines, shaft-governed, effect of unbalanced eccentric or governor weights on valve motion of, John E. Sweet (407), vol. 11 (1889-1890), p. 1053
- Engines, simple and compound, comparative variation in economy with change or load, R. C. Carpenter (523), vol. 14 (1892-1893), p. 426
- Engines, single-acting expansion, theorem of Rankine relating to economy of, W. P. Trowbridge (73), vol. 3 (1882), p. 252
- Engines, single-acting, offsetting cylinders in, T. M. Phetteplace (1240), vol. 31 (1909-1910), p. 223
- Engines, steam, apparatus for measuring and registering quantities of steam passing through conduits, or utilized in, Franz Seiler (337), vol. 14 (1892-1893), p. 751
- Engines, steam, consumption of, at various speeds, J. E. Denton and D. S. Jacobus (349), vol. 10 (1888-1889), p. 722
- Engine, steam, contribution to theory of, V. Dwellshauvers-Dery (527), vol. 14 (1892-1893), p. 572
- Engine, steam, efficiencies, R. H. Thurston (447), vol. 12 (1890-1891), p. 729
- Engines, steam, final report of committee on, (973), vol. 24 (1902-1903), p. 713
- Engines, steam, governor for, Jesse M. Smith (409), vol. 11 (1889-1890), p. 1081
- Engines, steam, most economical point of cut-off in, Alfred R. Wolf and J. E. Denton (33), vol. 2 (1881), p. 150
- Engines, steam, most economical point of cut-off in, Alfred R. Wolf and J. E. Denton (35), vol. 2 (1881), p. 288
- Engines, tests of three Sulzer, Hamilton A. Hill (735), vol. 18 (1896-1897), p. 795
- Engines, traction, investigation of the internal-combustion engine as applied to, A. A. Potter and W. A. Buck (1563), vol. 38 (1916-1917), p. 995

- Engines, triple-expansion, cylinder ratios of, Jay M. Whitham (338), vol. 10 (1888-1889), p. 576
- Engines, turbines vs., in units of small capacities, J. S. Barstow (1505), vol. 37 (1915-1916), p. 751
- Engines, two-cylinder, versus multi-cylinder, S. M. Green and Geo. I. Rockwood (499), vol. 13 (1891-1892), p. 647
- Engines, valves for steam, air engines and compressors, F. W. Gordon (824), vol. 20 (1898-1899), p. 967
- Engines, vapor, De Volson Wood (343), vol. 10 (1888-1889), p. 648
- Engines, vapor, theoretical investigation of efficiency of, De Volson Wood (420), vol. 12 (1890-1891), p. 155
- Engineer, Geo. H. Babcock (262), vol. 9 (1887-1888), p. 23
- Engineer, Chas. Wallace Hunt (792), vol. 20 (1898-1899), p. 27 (President's address, 1898)
- Engineer and publicity, C. E. Drayer (1452), vol. 36 (1914-1915), p. 573
- Engineer and the business of fire insurance, Joseph P. Gray (1498), vol. 37 (1915-1916), p. 591
- Engineer and the future, E. D. Meier (1324), vol. 33 (1911-1912), p. 493
- Engineer and the people, M. L. Cooke (1209), vol. 30 (1908-1909), p. 619
- Engineer as an economist, Henry R. Towne (207), vol. 7 (1885-1886), p. 428
- Engineer, present opportunities and consequent responsibilities of, Alex. C. Humphreys (1360), vol. 34 (1912-1913), p. 607
- Engineer's duty as a citizen, Geo. W. Melville (1285), vol. 32 (1910-1911), p. 527
- Engineering, design, and foundry department, W. A. Role (1169), vol. 29 (1907-1908), p. 849
- Engineering features of the Panama-Pacific International exposition, Guy L. Bayley (1490), vol. 37 (1915-1916), p. 351
- Engineering in the United States Navy, Geo. W. Melville (829), vol. 21 (1899-1900), p. 139 (President's address, 1899)
- Engineering index, mechanical, W. W. Bird and A. L. Smith (1129), vol. 28 (1906-1907), p. 675
- Engineering, industrial, realization of ideals in, H. F. J. Porter (1101), vol. 27 (1905-1906), p. 343
- Engineering, mechanical, at Panama-Pacific International exposition, George W. Dickie (1491), vol. 37 (1915-1916), p. 413
- Engineering methods, application of, to problems of executive, director and trustee, Hollis Godfrey (1501), vol. 37 (1915-1916), p. 633
- Engineering, municipal, some factors in, Morris L. Cooke (1454), vol. 36 (1914-1915), p. 631
- Engineering problem at Richmond, Va., W. H. Adams (434), vol. 12 (1890-1891), p. 451
- Engineering, profession of, Jesse M. Smith (1250), vol. 31 (1909-1910), p. 429
- Engineering schools, function of laboratory courses in curriculum of, Chas. E. Lucke (1087), vol. 26 (1904-1905), p. 646
- Engineering schools, industrial service work in, Joseph W. Roe (1432), vol. 36 (1914-1915), p. 171
- Entropy analysis for the Otto cycle, Sydney A. Reeve (961), vol. 24 (1902-1903), p. 171
- Entropy lines of superheated steam, A. M. Greene (1152), vol. 29 (1907-1908), p. 277
- Entropy-temperature diagram of a gas or oil engine, new graphical method of constructing from its indicator card, Henry T. Eddy (836), vol. 21 (1899-1900), p. 275
- Equipment of tall office buildings in New York City, R. P. Bolton (821), vol. 20 (1898-1899), p. 873
- Equipment, mechanical, of New South Station, Boston, Mass., W. C. Kerr (845), vol. 21 (1899-1900), p. 451
- Ethics, code of, report of committee on (1429), vol. 36 (1914-1915), p. 23
- Ethics of trade secrets, Frederick P. Fish (1137), vol. 29 (1907-1908), p. 13
- Evaporating by exhaust, steam (pans), Albert Stearns (244), vol. 8 (1886-1887), p. 421
- Evaporators, multiple, capacity and economy of, E. W. Kerr (1533), vol. 38 (1916-1917), p. 67
- Excavators, steam, Wm. L. Clements (301), vol. 9 (1887-1888), p. 515
- Exception principle for executives, graphical control on, Frank B. Gilbreth (1573a), vol. 38 (1916-1917), p. 1213
- Executive, director and trustee, application of engineering methods to the problems of, Hollis Godfrey (1501), vol. 37 (1915-1916), p. 633
- Executives, graphical control on exception principle for, Frank B. Gilbreth (1573a), vol. 38 (1916-1917), p. 1213
- Expansion in single and compound engines, J. C. Hoadley (12), vol. 1 (1880), p. 153
- Expansion, ratio of, at maximum efficiency, R. H. Thurston (32), vol. 2 (1881), p. 130
- Expense burden; its incidence and distribution, Sterling H. Bunnell (1326), vol. 33 (1911-1912), p. 535
- Extensometer, mirror, Gus. C. Henning (737), vol. 18 (1896-1897), p. 849
- Extensometer, roller, Gus. C. Henning (943), vol. 23 (1901-1902), p. 594
- Eye-bars, steel, tensile tests of, Gus. C. Henning (128a), vol. 4 (1882-1883), p. 420

F

- Facing machine. See boring and facing machine.
- Factories, sawtooth roofs for, K. C. Richmond (1122), vol. 28 (1906-1907), p. 413
- Factory buildings, allowable heights and areas for, Ira H. Woolson (1393c), vol. 35 (1913-1914), p. 231
- Factory buildings, reinforced-concrete, F. W. Dean (1443), vol. 36 (1914-1915), p. 403
- Factory roof construction, sawtooth skylight in, F. S. Hinds (1120), vol. 28 (1906-1907), p. 433
- Factory, standardization in, Carl B. Auel (1445), vol. 36 (1914-1915), p. 431
- Factory timbers. See timbers.
- Fan and engine, tests of a direct-connected 8-ft., E. S. Farwell (1018), vol. 25 (1903-1904), p. 145
- Fans, centrifugal, August J. Bowie, Jr. (1063), vol. 26 (1904-1905), p. 217
- Fans, centrifugal, for cupolas and forges, Wm. Sangster (880), vol. 22 (1900-1901), p. 354
- Feeders, automatic, for handling material in bulk, C. Kemble Baldwin (1235), vol. 31 (1909-1910), p. 161
- Ferryboat, double-screw, performance of, E. A. Stevens and J. E. Denton (375), vol. 11 (1889-1890), p. 372
- Ferryboats, improvement in, Wm. Cowles (195), vol. 7 (1885-1886), p. 190
- File and technical index, R. H. Soule (946), vol. 23 (1901-1902), p. 658
- Filing and indexing engineering literature notes, data, etc., method of, Geo. H. Marr (900), vol. 22 (1900-1901), p. 745
- Filing system for office use, Henry M. Lane (960), vol. 24 (1902-1903), p. 161
- Filter sands, a study of cleaning, Sanford E. Thompson (1457), vol. 36 (1914-1915), p. 693
- Filtration plant at Albany, N. Y., W. O. Webber (902), vol. 22 (1900-1901), p. 831
- Fire boats, Wm. Cowles (233), vol. 8 (1886-1887), p. 182
- Fire hazard in turbo-generators, C. S. Lawler (140), vol. 35 (1913-1914), p. 875
- Fire hydrants, experiments on various types of, Chas. L. Newcomb (811), vol. 20 (1898-1899), p. 494
- Fire insurance. See insurance.
- Fire loss, methods of reducing, C. J. H. Woodbury (372), vol. 11 (1889-1890), p. 271
- Fireproof buildings, floor surfaces in, Sanford E. Thompson (1442), vol. 36 (1914-1915), p. 387

- Fireproofing tests, report of progress of committee on (700), vol. 17 (1895-1896), p. 24
- Fire protection, discussion on (1393f), vol. 35 (1913-1914), p. 263
- Fire protection of mills, C. J. H. Woodbury (43), vol. 2 (1881), p. 308
- Fire, safeguards against, in cotton conveying systems, H. A. Burnham (1406), vol. 35 (1913-1914), p. 513
- Fire service, Baltimore high-pressure, James B. Scott (1393b), vol. 35 (1913-1914), p. 183
- Fire-service pumps. See pumps.
- Fires, in oils and volatile liquids, extinguishing of, Edw. A. Barrier (1421), vol. 35 (1913-1914), p. 589
- Fits and fitting, S. H. Moore (996), vol. 24 (1902-1903), p. 1158
- Fits, pressed, record of, C. F. MacGill (1417), vol. 35 (1913-1914), p. 819
- Fittings, cast-iron, for superheated steam, I. N. Hollis, E. F. Miller and A. S. Mann (1260), vol. 31 (1909-1910), p. 989
- Fittings, standard cast-iron, Wm. J. Baldwin (117), vol. 4 (1882-1883), p. 274
- Fittings and fixtures, report of the committee on standardization of special threads for (1474), vol. 37 (1915-1916), p. 25; (1525), vol. 37 (1915-1916), p. 1263
- Fixtures and fittings, special threads for, report of the committee on standardization of (1474), vol. 37 (1915-1916), p. 25
- Flange diameters, of pumps, valves, etc., of different makers, divergencies in, P. A. Sanguinetti (269), vol. 9 (1887-1888), p. 124
- Flange pipe, new method of casting, John E. Sweet (113), vol. 4 (1882-1883), p. 237
- Flanges, pipes, and their bolts, A. F. Nagle (817), vol. 20 (1898-1899), p. 737
- Flanges, standard, report of committee on (504), vol. 14 (1892-1893), p. 48
- Flanges, standardization of, report of committee on (1430), vol. 36 (1914-1915), p. 29
- Flat surfaces, staybolts, braces and, R. S. Hale (1061), vol. 26 (1904-1905), p. 177
- Floor surfaces in fireproof buildings, Sanford E. Thompson (1442), vol. 36 (1914-1915), p. 387
- Flour milling, Minneapolis, Chas. A. Lang (1439), vol. 36 (1914-1915), p. 341
- Flow metering apparatus, A. M. Levin (1436), vol. 36 (1914-1915), p. 239
- Flow meters. See meters.
- Flow of air through thin-plate orifices, Ernest O. Hickstein (1506), vol. 37 (1915-1916), p. 765
- Flow of steam in a tube, C. H. Peabody (322), vol. 10 (1888-1889), p. 316
- Flow of steam through orifices, C. H. Peabody and L. H. Kunhardt (363), vol. 11 (1889-1890), p. 187
- Fluids, flow of, in a Venturi tube, E. P. Coleman (1124), vol. 28 (1906-1907), p. 483
- Flywheel, broken, and how it was repaired, Jas. McBride (835), vol. 21 (1899-1900), p. 262
- Flywheel capacity for engine driven alternators, W. I. Slichter (956), vol. 24 (1902-1903), p. 98
- Flywheels, bursting of small cast-iron, C. H. Benjamin (800), vol. 20 (1898-1899), p. 209
- Fly wheel design, note on, A. J. Frith (839), vol. 21 (1899-1900), p. 317
- Flywheel, novel, C. H. Manning (497), vol. 13 (1891-1892), p. 618
- Flywheels, bursting of, Chas. H. Benjamin (1064), vol. 26 (1904-1905), p. 232
- Flywheels, bursting of small cast iron, C. H. Benjamin (921), vol. 23 (1901-1902), p. 168
- Flywheels, determination of, to keep angular variation of an engine within fixed limit, J. I. Astrom (907), vol. 22 (1900-1901), p. 955
- Flywheels, rolling-mill, John Fritz (823), vol. 20 (1898-1899), p. 944
- Flywheels, stresses in rims and rim joints of pulleys and, Gaetano Lanza (621), vol. 16 (1894-1895), p. 208
- Flywheels, structural steel, Thos. E. Murray (685), vol. 17 (1895-1896), p. 413
- Forge shop design. See design.
- Forges, and cupolas, centrifugal fans for, Wm. Sangster (880), vol. 22 (1900-1901), p. 354
- Forging presses, power with special reference to steam-hydraulic forging, Barthold Gerdaun and George Meata (1322), vol. 33 (1911-1912), p. 469
- Forgings, hollow steel, H. F. J. Porter (681), vol. 17 (1895-1896), p. 359
- Forgings, steel, notes on, G. M. Sinclair (622), vol. 16 (1894-1895), p. 228
- Forgings, steel, boiler plate, rivet steel and steel castings, report of committee on specifications for (1026), vol. 25 (1903-1904), p. 321
- Forgings, steel, steel castings and steel boiler plates, specifications for, W. R. Webster (945), vol. 23 (1901-1902), p. 632
- Forgings, steel, boiler plate, rivet steel and steel castings, specifications for (979), vol. 24 (1902-1903), p. 921
- Formation of anchor ice, Howard T. Barnes (1082), vol. 26 (1904-1905), p. 558
- Foundations, Charles T. Main (1508), vol. 37 (1915-1916), p. 821
- Foundry and machine shop, power and light for, Forrest R. Jones (881), vol. 22 (1900-1901), p. 366
- Foundry blower practice, W. B. Snow (1175), vol. 29 (1907-1908), p. 923
- Foundry cupola, and iron mixtures, W. J. Keep (1174), vol. 29 (1907-1908), p. 903
- Foundry cupola experience, F. A. Scheffle (299), vol. 9 (1887-1888), p. 496
- Foundry cupola experience, F. A. Scheffler (314), vol. 10 (1888-1889), p. 89
- Foundry department and department of engineering design, W. A. Bole (1169), vol. 29 (1907-1908), p. 849
- Foundry for bench work, W. J. Keep and Emmet Dwyer (1172), vol. 29 (1907-1908), p. 891
- Foundry output, method of testing, R. Moldenke (1173), vol. 29 (1907-1908), p. 897
- Foundry, power service in, A. D. Williams (1171), vol. 29 (1907-1908), p. 877
- Foundry work, estimating cost of, Geo. L. Fowler (288), vol. 9 (1887-1888), p. 390
- Friction, acceleration and gravity, transmission of force in a steam engine, influenced by action of, D. S. Jacobus (377), vol. 11 (1889-1890), p. 492
- Friction as a factor in motive power expenses, John E. Sweet (11), vol. 1 (1880), p. 141
- Friction brakes, new forms of, W. F. M. Goss (645), vol. 16 (1894-1895), p. 806
- Friction of lubricating oils, measurement of, C. J. H. Woodbury (7), vol. 1 (1880), p. 74; (163), vol. 6 (1884-1885), p. 136
- Friction of rotation, sliding, R. H. Thurston (162), vol. 6 (1884-1885), p. 122
- Friction, comparative loss by, in a transmitting dynamometer under different loads and speeds, Samuel Webber (334), vol. 10 (1888-1889), p. 514
- Friction driving, power transmission by, W. F. M. Goss (1180), vol. 29 (1907-1908), p. 1093
- Friction horsepower in factories, C. H. Benjamin (712), vol. 18 (1890-1897), p. 228
- Friction in toothed gearing, Gaetano Lanza (273), vol. 9 (1887-1888), p. 185
- Friction in toothed gearing, F. Reuleaux (227), vol. 8 (1886-1887), p. 45
- Friction, internal, of engines, distribution of, R. H. Thurston (316), vol. 10 (1888-1889), p. 110
- Friction, internal, of non-condensing engines, R. H. Thurston (265), vol. 9 (1887-1888), p. 74
- Friction, internal, variable load, engine speed and work, R. H. Thurston (317), vol. 10 (1888-1889), p. 138
- Friction losses in the universal joint, P. F. Walker and W. J. Malcolmson (1447), vol. 36 (1914-1915), p. 461
- Friction in non-condensing engines, R. H. Thurston (288), vol. 8 (1886-1887), p. 86
- Friction of screws, experiments on, Albert Kingsbury (669), vol. 17 (1895-1896), p. 96

Friction of steam packings, C. H. Benjamin (837), vol. 21 (1899-1900), p. 292
 Friction tests of a locomotive slide valve, Frank C. Wagner (833), vol. 21 (1899-1900), p. 242
 Friction wheels, paper, W. F. M. Goss (705), vol. 18 (1896-1897), p. 102
 Frictional resistance of engine, and shafting in mills, power required to overcome, and its cost, J. T. Henthorn (174), vol. 6 (1884-1885), p. 461
 Frictional resistance of shafting in engineering establishments, Samuel Webber (191), vol. 7 (1885-1886), p. 138
 Fuel and iron, specifications for, and method of testing foundry output, R. Moldenke (1173), vol. 29 (1907-1908), p. 897
 Fuel, bituminous, gas producer for, O. C. Berry (1560), vol. 38 (1916-1917), p. 923
 Fuel combustion, liquid, Chas. E. Lucke (936), vol. 23 (1901-1902), p. 483
 Fuel consumption of locomotives, G. R. Henderson (1066), vol. 26 (1904-1905), p. 258
 Fuel economy tests at a large oil burning electric plant, C. R. Weymouth (1213), vol. 30 (1908-1909), p. 775
 Fuel in steam engine, practical methods for greater economy of, Allan Stirling (18), vol. 1 (1880), p. 261
 Fuel, means adopted for saving in large oil refinery, C. E. Emery (671), vol. 17 (1895-1896), p. 141
 Fuel, oil, for steam boilers, B. R. T. Collins (1308), vol. 33 (1911-1912), p. 83
 Fuel oil, topical discussion on (1307), vol. 33 (1911-1912), p. 27
 Fuel oil, unnecessary losses in firing, C. R. Weymouth (1214), vol. 30 (1908-1909), p. 797
 Fuel, powdered coal, in industrial furnaces, an installation for, William Dalton and W. S. Quigley (1431b), vol. 36 (1914-1915), p. 109
 Fuel, powdered, topical discussion on (1431d), vol. 36 (1914-1915), p. 137
 Fuel, practical operation of gas engines using blast-furnace gas as, Charles C. Sampson (1392), vol. 35 (1913-1914), p. 151
 Fuel, pulverized, for locomotives, John E. Muhlfield (1566), vol. 38 (1916-1917), p. 1043
 Fuel, water gas as, William Kent (235), vol. 8 (1886-1887), p. 225
 Fuels, low-grade, rational utilization of, F. E. Junge (1165), vol. 29 (1907-1908), p. 663
 Furnace and boiler efficiency, R. S. Hale (819), vol. 20 (1898-1899), p. 769
 Furnace and superheat relations, R. P. Bolton (1151), vol. 29 (1907-1908), p. 261
 Furnaces, corrugated, use of for vertical fire tube boilers, F. W. Dean (1475), vol. 37 (1915-1916), p. 31
 Furnace, crucible, for burning petroleum, W. E. Crane (571), vol. 15 (1893-1894), p. 307
 Furnace, down-draft, for steam boilers, W. H. Bryan (644), vol. 16 (1894-1895), p. 773
 Furnace, heating, D. H. Nicholson (393), vol. 11 (1889-1890), p. 896
 Furnace, ingot-heating, improved type of, F. H. Daniels (898), vol. 22 (1900-1901), p. 658
 Furnaces, industrial, an installation for powdered coal fuel in, William Dalton and W. S. Quigley (1431b), vol. 36 (1914-1915), p. 109
 Furnaces, metallurgical, regenerating, Jacob Reese (5), vol. 1 (1880), p. 58
 Future of the police arm from an engineering standpoint, Henry Brèure (1449), vol. 36 (1914-1915), p. 535

G

Gage, new form of pressure, F. H. Stillman (844), vol. 21 (1899-1900), p. 439
 Gage, new recording pressure, for low ranges of pressure, W. H. Bristol (518), vol. 14 (1892-1893), p. 325
 Gage, pressure, for high ranges of pressures, new recording, W. H. Bristol (602), vol. 15 (1893-1894), p. 1119

Gage, recording pressure, W. H. Bristol (368), vol. 11 (1889-1890), p. 225
 Gage system, standard (linear measures), Geo. M. Bond (63), vol. 3 (1882), p. 132
 Gages, pipe thread, standardization of (1399), vol. 35 (1913-1914), p. 309
 Galvanizing rustless coatings for iron and steel, electro-chemical treatment, M. P. Wood (626), vol. 16 (1894-1895), p. 350
 Gas analyses, flue, in boiler tests, R. S. Hale (740), vol. 18 (1896-1897), p. 901
 Gas, blast-furnace, as fuel, Charles C. Sampson (1392), vol. 35 (1913-1914), p. 151
 Gas calorimeter. See calorimeter.
 Gas conduits, simple method of cleaning, W. D. Mount (1203), vol. 30 (1908-1909), p. 437
 Gas engine. See engine.
 Gas, engineering, problems in, Thos. R. Weymouth (1349), vol. 34 (1912-1913), p. 185
 Gas engines, control of combustion in. See engines.
 Gas, gasoline, experiments on using for boiler heating, Herman Poole (831), vol. 21 (1899-1900), p. 172
 Gas measurement, pitot tubes for, W. C. Rowse (1411), vol. 35 (1913-1914), p. 633
 Gas, methane, physical laws of, P. F. Walker (1461), vol. 36 (1914-1915), p. 781
 Gas, natural, deviation of, from Boyle's law, Robert F. Earhart and Samuel S. Wyer (1537), vol. 38 (1916-1917), p. 285
 Gas, natural, establishing a standard of measurement for, in large quantities, Francis P. Fisher (1536), vol. 38 (1916-1917), p. 241
 Gas, natural, for industrial purposes (151), vol. 5 (1883-1884), p. 340
 Gas, natural, measurement of, T. R. Weymouth (1376), vol. 34 (1912-1913), p. 1091
 Gas, natural, use of, under boilers, Jay M. Whitman (1097), vol. 27 (1904-1905), p. 171
 Gas power and steam plants, cooling towers for, J. R. Bibbins (1259), vol. 31 (1909-1910), p. 725
 Gas power, evolution of, F. E. Junge (1133), vol. 28 (1906-1907), p. 771
 Gas power, marine producer, C. L. Straub (1238), vol. 31 (1909-1910), p. 185
 Gas power plant, duty test on, J. R. Bibbins and G. L. Alden (1166), vol. 29 (1907-1908), p. 725
 Gas power plant, operating experiences with a blast furnace, H. J. Freyn (1281), vol. 32 (1910-1911), p. 369
 Gas power plant, producer, J. R. Bibbins (1126), vol. 28 (1906-1907), p. 549
 Gas power plant, producer, operation of a small, C. W. Obert (1239), vol. 31 (1909-1910), p. 209
 Gas-power plants, large blast-furnace (1314), vol. 33 (1911-1912), p. 293
 Gas power, recent development of, in Europe, H. J. Freyn (1375), vol. 34 (1912-1913), p. 1073
 Gas producer. See producer.
 Gas, producer, commercial sampling and analysis of, Philip W. Swain (1561), vol. 38 (1916-1917), p. 961
 Gas, producer, new process of cleaning, H. F. Smith (1418), vol. 35 (1913-1914), p. 837
 Gas tests, producer, R. H. Fernald (1100), vol. 27 (1905-1906), p. 302
 Gas, water, and gas from Siemens producer for melting in openhearth furnace, relative value of, Fred W. Taylor (219), vol. 7 (1885-1886), p. 669
 Gas, water, as fuel, William Kent (235), vol. 8 (1886-1887), p. 225
 Gas weights, measuring, Thomas E. Butterfield (1481), vol. 37 (1915-1916), p. 143
 Gases, compression and liquefaction of, Arthur L. Rice (830), vol. 21 (1899-1900), p. 156
 Gases, exhaust, method of determining the temperature of, R. H. Fernald (949), vol. 23 (1901-1902), p. 686
 Gases, inflammable, testing of, C. E. Sargent (1138), vol. 29 (1907-1908), p. 41
 Gasoline engines. See engines.

Gasoline gas. See gas.

Gear-cutting machines, bevel, at Paris, Fred J. Miller (897), vol. 22 (1900-1901), p. 672

Gear, silent chain, J. O. Nixon (929), vol. 23 (1901-1902), p. 373

Gear, Stevens valve, for marine engines, Andrew Fletcher (769), vol. 19 (1897-1898), p. 449

Gear, street car, for modern speeds, S. J. MacFarren (370), vol. 11 (1889-1890), p. 254

Gear teeth, diagrams for relative strength of, Forrest R. Jones (734), vol. 18 (1896-1897), p. 766

Gear teeth, strength of, Guido H. Marx (1382), vol. 34 (1912-1913), p. 1323

Gear teeth, strength of, G. H. Marx and L. E. Cutter (1494), vol. 37 (1915-1916), p. 503

Gear testing machine, Wilfred Lewis (1435), vol. 36 (1914-1915), p. 231

Gear tooth, persistent form of, J. B. Webb (289), vol. 9 (1887-1888), p. 398

Gear-tooth systems, interchangeable involute, Ralph E. Flanders (1218), vol. 30 (1908-1909), p. 921

Gearing, experiments on transmission of power by, Wilfred Lewis (198), vol. 7 (1885-1886), p. 273

Gearing friction. See friction.

Gearing, interchangeable involute, Wilfred Lewis (1292b), vol. 32 (1910-1911), p. 837

Gearing, spur, on heavy railway motor equipments, Norman Litchfield (1219), vol. 30 (1908-1909), p. 967

Gearing, tooth, J. D. Stevens (1292a), vol. 32 (1910-1911), p. 807

Gearing, toothed, friction in, F. Reuleaux (227), vol. 8 (1886-1887), p. 45; Gaetano Lanza (273), vol. 9 (1887-1888), p. 185

Gearing, worm, investigation of efficiency of, for automobile transmission, Wm. H. Kenerson (1371), vol. 34 (1912-1913), p. 919

Gearing, worm, diametral pitch of, S. W. Powell and W. L. Cheney (324), vol. 10 (1888-1889), p. 333

Gears, bevel, experimental investigation of, cutting of, with rotary cutters, Forrest R. Jones and A. L. Goddard (703), vol. 17 (1895-1896), p. 75

Gears for machine-tool drives, John Parker (1415), vol. 35 (1913-1914), p. 785

Gears, herringbone, with special reference to the Wuest system, Percy C. Day (1330), vol. 33 (1911-1912), p. 681

Gears, strength of, chart, John B. Mayo (758), vol. 19 (1897-1898), p. 109

Generating sets, direct-connected electric, standards for, J. B. Stanwood (818), vol. 20 (1898-1899), p. 758

Generation and transmission, water power, Samuel Webber (665), vol. 17 (1895-1896), p. 41

Generator sets, electric, direct-connected, some details of, W. H. Bryan (939), vol. 23 (1901-1902), p. 524

Governing by compression, John H. Barr (627), vol. 16 (1894-1895), p. 430

Governor, centrifugal, description of improved, Chas. T. Porter (617), vol. 16 (1894-1895), p. 134

Governor drives, positive, for Corliss engines, A. H. Eldredge (995), vol. 24 (1902-1903), p. 1151

Governor, engine. See engine, engines.

Governor for steam engines, Jesse M. Smith (409), vol. 11 (1889-1890), p. 1081

Governor, shaft, analysis of, F. M. Rites (510), vol. 14 (1892-1893), p. 92

Governor, shaft, improved form of, Frank H. Ball (281), vol. 9 (1887-1888), p. 300

Governor, shaft, new, E. J. Armstrong (640), vol. 16 (1894-1895), p. 729

Governor, water wheel, some stepping stones in development of a modern, Mark A. Replogle (1110), vol. 27 (1905-1906), p. 642

Governors, shaft, notes on theory of, A. K. Mansfield (594), vol. 15 (1893-1894), p. 929

Governors, shaft, inertia in, E. J. Armstrong (408), vol. 11 (1889-1890), p. 1068

Governors, steam engine, Frank H. Ball (714), vol. 18 (1896-1897), p. 290

Grain, handling, in California, J. H. Cooper (218), vol. 7 (1885-1886), p. 650

Graphic diagrams and glyptic models, R. H. Thurston (773), vol. 19 (1897-1898), p. 514

Graphics, deflection of beams by, W. Trinks (957), vol. 24 (1902-1903), p. 116

Graphite, fiber, self-lubricating, for bearings of machinery, J. H. Cooper (486), vol. 13 (1891-1892), p. 374

Grates with small percentage of openings, tests of a boiler using, F. A. Scheffler (575), vol. 15 (1893-1894), p. 503

Grinding, field for, C. H. Norton (1301a), vol. 32 (1910-1911), p. 1311

Grinding methods, modern, B. M. W. Hanson, (1301c), vol. 32 (1910-1911), p. 1337

Grinding, precision, Wm. A. Viall (1301b), vol. 32 (1910-1911), p. 1325

Grinding wheels, operation of, in machine grinding, Geo. I. Alden (1446), vol. 36 (1914-1915), p. 451

Gun factory, U. S. Army, Watervliet Arsenal, J. M. B. Scheele (980), vol. 24 (1902-1903), p. 929

H

Hammer blow, effect of, A. W. Moseley and J. L. Bacon (1108), vol. 27 (1905-1906), p. 605

Hammer head and die, Wm. Hewitt (157), vol. 6 (1884-1885), p. 77

Hammers, air, air and motors; apparatus and method for testing, M. H. Wickhorst (1015), vol. 25 (1903-1904), p. 107

Haulage by horses, Thos. H. Briggs (544), vol. 14 (1892-1893), p. 1014

Haulage systems, two-rope, R. Van A. Norris (439), vol. 12 (1890-1891), p. 626

Heat and power, distribution in cement mills, L. L. Griffiths (1311c), vol. 33 (1911-1912), p. 165

Heat and water consumption of a compound engine at various powers, D. S. Jacobus (999), vol. 24 (1902-1903), p. 1274

Heat, comparative value of steam and hot water for transmitting, Chas. E. Emery (250), vol. 8 (1886-1887), p. 512

Heat, expansion of steam and water without transfer of, Faber Du Faur (70), vol. 3 (1882), p. 223

Heat, experiments with non-conductors of, Chas. E. Emery (21), vol. 2 (1881), p. 34

Heat generated per candle-power by oil and gas lamps, experimental determination of, D. S. Jacobus (519), vol. 14 (1892-1893), p. 331

Heat-insulating properties of commercial steam pipe coverings, L. B. McMillan (1514), vol. 37 (1915-1916), p. 921

Heat, latent, of ammonia and sulphur dioxide, experimental determination of, D. S. Jacobus (431), vol. 12 (1890-1891), p. 307

Heat, mechanical theory of, A. R. Wolff (13), vol. 1 (1880), p. 209

Heat of saturated steam, H. N. Davis (1212), vol. 30 (1908-1909), p. 741

Heat of vapors, method of obtaining ratios of, A. R. Dodge (1211), vol. 30 (1908-1909), p. 723

Heat resistance, the reciprocal of heat conductivity, William Kent (966), vol. 24 (1902-1903), p. 278

Heat, specific, negative, De Volson Wood (508), vol. 14 (1892-1893), p. 75

Heat, specific, of natural gas from typical fields, Robert F. Earhart (1562), vol. 38 (1916-1917), p. 979

Heat, specific, of platinum and use of the metal in pyrometer, J. C. Hoadley (65), vol. 3 (1882), p. 187

Heat, specific, of superheated steam, C. C. Thomas (1178), vol. 29 (1907-1908), p. 1021

Heat, tests upon transmission of, in vacuum evaporators, E. W. Kerr (1413), vol. 35 (1913-1914), p. 731

Heat transfer apparatus, basis for rational design of, E. E. Wilson (1477), vol. 37 (1916-1916), p. 47

Heat transfer of, at high temperatures, Frank C. Wagner (1084), vol. 26 (1904-1905), p. 594

Heat, transmission of, in boilers, E. R. Hedrick and E. A. Fessenden (1541), vol. 38 (1916-1917), p. 407

Heat, transmission of, in surface condensation, Geo. A. Orrok (1297), vol. 32 (1910-1911), p. 1139

Heat transmission through cast iron plates pickled in nitric acid, R. C. Carpenter (421), vol. 12 (1890-1891), p. 174

Heat transmission through cast iron plates pickled in acid, Daniel Royse (461), vol. 12 (1890-1891), p. 1014

Heat transmission through various types of saah, Arthur N. Sheldon (1557), vol. 38 (1916-1917), p. 857

Heat treatment of wrought iron chain cable, W. W. Webster, E. L. Patch and F. G. Coburn (1571), vol. 38 (1916-1917), p. 1159

Heat units, and pumping engines, (duty of pumping engines), specifications for, A. F. Hall (801), vol. 15 (1893-1894), p. 1103

Heat, utilization of from burning refuse, C. N. Russell (1044), vol. 25 (1903-1904), p. 982

Heat, waste, utilization of for steam-generating purposes, Arthur D. Pratt (1550), vol. 38 (1916-1917), p. 599

Heating and ventilating and office and warehouse building, economical method of, Henry I. Snell (267), vol. 9 (1887-1888), p. 99

Heating apparatus, automatic regulator for, J. T. Hawkins (292), vol. 9 (1887-1888), p. 431

Heating by forced circulation of hot water in textile mills, Albert G. Duncan (1496), vol. 37 (1915-1916), p. 543

Heating surface required in ventilating flues, determination of, W. P. Trowbridge (60), vol. 3 (1882), p. 72

Heating furnaces. See furnaces.

Heating, hot water, from a central station, H. T. Varyan (860), vol. 21 (1899-1900), p. 937

Heating of store houses, cost of, H. O. Lacount (1148), vol. 29 (1907-1908), p. 159

Heating plant central, of the University of Wisconsin, Storm Bull (822), vol. 20 (1898-1899), p. 897

Heating system for cars, Henry R. Towne (294), vol. 9 (1887-1888), p. 453

Heating value, and classification, of American coals, William Kent (1433), vol. 36 (1914-1915), p. 189

Helical seams, in boiler making, R. H. Thurston (242), vol. 8 (1886-1887), p. 357

High-pressure fire service, Baltimore, James B. Scott (1393b), vol. 35 (1913-1914), p. 183

High-speed in engineering, record of early period of, Chas. T. Porter (869), vol. 22 (1900-1901), p. 65

High-speed wheels, increase of bore of, by centrifugal stresses, Sanford A. Moss (1370), vol. 34 (1912-1913), p. 895

Hoisting and conveying machinery, G. E. Titcomb (1190), vol. 30 (1907-1908), p. 123

Hoisting and conveying, report on (1403), vol. 35 (1913-1914), p. 405

Hoisting hooks, data on, J. L. Bacon (992), vol. 24 (1902-1903), p. 1126

Horizontal tubular boilers. See boilers.

Horsepower, value of, Geo. I. Rockwood (848), vol. 21 (1899-1900), p. 590

Hotwell, use of, as oil extractor, A. H. Eldredge (994), vol. 24 (1902-1903), p. 1144

Human element the key to economic problems, James Hartness (1441), vol. 36 (1914-1915), p. 365

Humidity, relative, effect of, on an oak tanned leather belt, William W. Bird and Francis W. Royce (1480), vol. 37 (1915-1916), p. 129

Hydraulic air compressor. See compressor.

Hydraulic and electric power plant, Middleborough Dock, V. L. Raven (1043), vol. 25 (1903-1904), p. 943

Hydraulic buffer, test of, Carl Schwartz (1389), vol. 35 (1913-1914), p. 99

Hydraulic elevator. See elevator.

Hydraulic experiment on water supply stand-pipe, A. F. Nagle (1067), vol. 26 (1904-1905), p. 274

Hydraulic hoisting plant for the pier of the Brooklyn Sugar Refining Company, L. G. Engel (430), vol. 12 (1890-1891), p. 286

Hydraulic obstruction in closed streams, law of, David Guelbaum (761), vol. 19 (1897-1898), p. 216

Hydraulic power plant. See power plant.

Hydroelectric plants, speed regulation in, Wm. F. Uhl (1354), vol. 34 (1912-1913), p. 379

Hydroelectric plant, improvement of, installation of Chattanooga and Tennessee River Power Company at Hale's Bar, Tenn., Thos. E. Murray (1105), vol. 27 (1905-1906), p. 620

Hydrostatic chord, R. D. Johnson (1284), vol. 32 (1910-1911), p. 521

Hydrostatic pressures. See pressures.

I

Ice machinery, binary absorption system of, H. F. J. Porter (36), vol. 2 (1881), p. 218

Ignition, spontaneous, studied by means of photographic plates, Frederick J. Hoxie (1556), vol. 38 (1916-1917), p. 841

Impact, W. J. Keep (842), vol. 21 (1899-1900), p. 369

Impact tube, Sanford A. Moes (1554), vol. 38 (1916-1917), p. 761

Index and classification, engineering, Wm. L. Chase (539), vol. 14 (1892-1893), p. 780

Index, wheel, exact subdivision of, into any required number of equal parts, W. A. Rogers (443), vol. 12 (1890-1891), p. 696

Indexing drawings and patterns, Albert F. Hall (48), vol. 2 (1881), p. 378

Indicator card, length of, J. B. Webb (397), vol. 11 (1889-1890), p. 941

Indicator card, new graphical method of constructing entropy-temperature diagram of a gas or oil engine from, Henry T. Eddy (836), vol. 21 (1899-1900), p. 275

Indicator cock, improved for engines, A. K. Mansfield (937), vol. 23 (1901-1902), p. 511

Indicator, continuous steam engine, Thomas Gray (744), vol. 18 (1896-1897), p. 1020

Indicator diagram, Chas. E. Emery (280), vol. 9 (1887-1888), p. 293

Indicator diagrams, saturation curve as reference line for, R. C. Carpenter (592), vol. 15 (1893-1894), p. 904

Indicator, fare, and receipt controller, C. Pieper (529), vol. 14 (1892-1893), p. 619

Indicator for continuous records in dynamometric testing, W. S. Aldrich (563), vol. 15 (1893-1894), p. 112

Indicator, positive speed, Oberlin Smith (144), vol. 5 (1883-1884), p. 206

Indicator rigging for compound engines, Fred W. Parsons (367), vol. 11 (1889-1890), p. 222

Indicator springs. See springs.

Indicator, steam engine, C. W. Barnaby (210), vol. 7 (1885-1886), p. 489

Indicator, steam engine, new form of, J. B. Webb (99), vol. 4 (1882-1883), p. 182

Indicators, comparison of, J. B. Webb (373), vol. 11 (1889-1890), p. 311

Indicators, comparison of mean effective pressures of simultaneous cards taken by different, D. S. Jacobus (570), vol. 15 (1893-1894), p. 277

Indicators, engine, improved motion device for, A. W. Jacobi (339), vol. 10 (1888-1889), p. 586

Indicators, methods of testing, D. S. Jacobus (805), vol. 20 (1898-1899), p. 404

- Indicators, modern, comparison of three types of, Geo. H. Barrus (150), vol. 5 (1883-1884), p. 310
- Indicator, pressure recording, for punching machinery (1319), vol. 33 (1911-1912), p. 369
- Indicators, steam engine, apparatus for dynamically testing, Carleton A. Read (872), vol. 22 (1900-1901), p. 114
- Indicators, steam engine, effect upon diagrams of long pipe connections for, W. F. M. Goss (684), vol. 17 (1895-1896), p. 398
- Industrial management. See management.
- Industrial service work in engineering schools, Joseph W. Roe (1432), vol. 36 (1914-1915), p. 171
- Industrial valuation. See valuation.
- Indexing filing and engineering literature, notes, data, etc., method of, Geo. H. Marr (900), vol. 22 (1900-1901), p. 745
- Index and file, technical, R. H. Soule (946), vol. 23 (1901-1902), p. 658
- Inertia, in shaft governors, E. J. Armstrong (408), vol. 11 (1889-1890), p. 1068
- Inertia, theory of moment of, C. V. Kerr (629), vol. 16 (1894-1895), p. 477; (799), vol. 20 (1898-1899), p. 177
- Inflammable gases. See gases.
- Ingot-heating furnace. See furnace.
- Injector, mechanics of the, J. B. Webb (325), vol. 10 (1888-1889), p. 339
- Injector, use of superheated steam in, S. L. Kneass (1155), vol. 29 (1907-1908), p. 311
- Instrument, averaging, for polar diagrams, W. F. Durand (1226), vol. 30 (1908-1909), p. 1201
- Instruments of precision at Paris exposition of 1900, Wm. R. Reed (898), vol. 22 (1900-1901), p. 721
- Insurance, fire, the engineer and business of, Joseph P. Gray (1498), vol. 37 (1915-1916), p. 591
- Interchangeable construction in mechanism, history and modern development of art of, W. F. Durfee (549), vol. 14 (1892-1893), p. 1225
- Interchangeable parts, small, assembly of, John Calder (1312a), vol. 33 (1911-1912), p. 195
- Internal-combustion engine. See engine.
- Inventions, letters patent for. See letters patent.
- Inventory valuation of machinery plant, Oberlin Smith (208), vol. 7 (1885-1886), p. 433
- Inventory value, perpetual, relation between, and appraisal value, Charles Piez (1576), vol. 38 (1916-1917), p. 1285
- Involute gearing, interchangeable. See gearing.
- Iron and fuel, specifications for, and method of testing foundry output, R. Moldenke (1173), vol. 29 (1907-1908), p. 897
- Iron and steel, effect of alternate positive and negative stresses on, Thomas Gray (730), vol. 18 (1896-1897), p. 706
- Iron and steel, progress in the manufacture of, John Fritz (701), vol. 17 (1895-1896), p. 39
- Iron and steel, antirust coating for, M. P. Wood (598), vol. 15 (1893-1894), p. 998; (713), vol. 18 (1896-1897), p. 251; (628), vol. 16 (1894-1895), p. 305; (637), vol. 16 (1894-1895), p. 663
- Iron and steel, yield point of, Thomas Gray (731), vol. 18 (1896-1897), p. 711
- Iron and steel, working stress of, Benj. Baker (232), vol. 8 (1886-1887), p. 157
- Iron castings. See castings.
- Irons, chillable, tests of, Thos. D. West (1351), vol. 34 (1912-1913), p. 273
- Iron, crystallization of, Wm. Hill (197), vol. 7 (1885-1886), p. 241
- Iron, in combination with beton, as building material, W. E. Ward (126), vol. 4 (1882-1883), p. 388
- Iron mixtures in foundry cupola, W. J. Keep (1174), vol. 29 (1907-1908), p. 903
- Iron process, Bower-Barff rustless, Geo. W. Maynard (123), vol. 4 (1882-1883), p. 351
- Iron, strength of, as affected by tensile stress while hot, DeVolson Wood (641), vol. 16 (1894-1895), p. 739
- Iron, wrought, and steel, effect of temperature on strength of, R. C. Carpenter (674), vol. 17 (1895-1896), p. 198
- J
- Jigs, drill, new device for, B. Cruikshank (558), vol. 15 (1893-1894), p. 60
- Joint, swiveling, for a 16-in. high-pressure steam main, R. E. Curtis (934), vol. 23 (1901-1902), p. 469
- Joints in fly-band wheels, strength of rim, J. B. Stanwood (565), vol. 15 (1893-1894), p. 147
- Journal bearings. See bearings.
- Journal friction measuring machine, Henry Hess (1198), vol. 30 (1908-1909), p. 331
- K
- Keep's cooling curves, W. J. Keep (656), vol. 16 (1894-1895), p. 1117
- Kerosene in steam boilers, R. C. Carpenter (396), vol. 11 (1889-1890), p. 937
- Kiln, cement, long, economy of, E. C. Soper (1145), vol. 29 (1907-1908), p. 143
- Kinzua viaduct. See viaduct.
- L
- Labor, bonus system for rewarding, H. L. Gantt (928), vol. 23 (1901-1902), p. 341
- Labor, high-priced, capital's need for, Wm. E. Partridge (239), vol. 8 (1886-1887), p. 269
- Labor, premium plan of paying for, F. A. Halsey (449), vol. 12 (1890-1891), p. 755
- Laps and lapping, W. A. Knight and A. A. Case (1488), vol. 37 (1915-1916), p. 297
- Lathe, a 44-ft. pit, John M. Barnay (964), vol. 24 (1902-1904), p. 243
- Lathe, beds strains in, Geo. W. Bissell (512), vol. 14 (1892-1893), p. 147
- Lathe-tool dynamometer. See dynamometer.
- Lathe, turret, screw die for, James Hartness (753), vol. 19 (1897-1898), p. 77
- Lathes and screw machines, automatic mechanical control of, Luther D. Burlingame (1521), vol. 37 (1915-1916), p. 1143
- Leather belts. See belts.
- Leavitt pumping engine. See engine.
- Letters patent for inventions, D. Howard Haywood (1310), vol. 33 (1911-1912), p. 119
- Light and power, for the machine shop and foundry, Forrest R. Jones (881), vol. 22 (1900-1901), p. 366
- Lighting, gas, by incandescence, James Dredge (257), vol. 8 (1886-1887), p. 663
- Lighting, train, H. A. Currie and Benj. F. Wood (1380), vol. 34 (1912-1913), p. 1255
- Lignite, North Dakota, experiments with, in steam power plant and gas producer, Calvin H. Crouch (1365), vol. 34 (1912-1913), p. 795
- Lineshaft bearings. See bearings.
- Line-shaft efficiency, mechanical and economic, Henry Hess (1266), vol. 31 (1909-1910), p. 923
- Liquefaction and compression of gases, Arthur L. Rice (830), vol. 21 (1899-1900), p. 156
- Locks (door) and their failings, A. C. Hobbs (167), vol. 6 (1884-1885), p. 233
- Locomotives, Allen valve for, C. H. Quercan (809), vol. 20 (1898-1899), p. 475
- Locomotives, Brooks passenger road tests of, E. A. Hitchcock (1068), vol. 26 (1904-1905), p. 290
- Locomotive, application of brakes to truck wheels of, Gaetano Lanza (610), vol. 16 (1894-1895), p. 69
- Locomotives, articulated compound, C. J. Mellin (1220), vol. 30 (1908-1909), p. 985

- Locomotive at Laboratory of Purdue University, tests of W. F. M. Goss (542), vol. 14 (1892-1893), p. 826
- Locomotive boilers. See boilers.
- Locomotive, compound, development of, A. Von Borries (547), vol. 14 (1892-1893), p. 1172
- Locomotive, counterbalancing reciprocating parts of, Gaetano Lanza (321), vol. 10 (1888-1889), p. 302
- Locomotive drive wheels, counterbalance in, W. F. M. Goss (625), vol. 16 (1894-1895), p. 305
- Locomotive driving wheels, rail pressures of, D. L. Barnes (624), vol. 16 (1894-1895), p. 249
- Locomotive exhibits at Paris exhibition of 1900, Storm Bull (903), vol. 22 (1900-1901), p. 842
- Locomotive, experimental, W. F. M. Goss (490), vol. 13 (1891-1892), p. 427
- Locomotive, parallel and radial axles operation of, by a single set of cylinders, Antole Mallet (1502), vol. 37 (1915-1916), p. 653
- Locomotive pile driver, Bucyrus, Walter Ferris (1265), vol. 31 (1909-1910), p. 905
- Locomotive, Purdue, tests of the boiler of, W. F. M. Goss (885), vol. 22 (1900-1901), p. 453
- Locomotive "Sampson," D. W. Robb (333), vol. 10 (1888-1889), p. 509
- Locomotive slide valve. See valve.
- Locomotive stay bolts, bending tests of, Francis J. Cole (778), vol. 19 (1897-1898), p. 662
- Locomotive superheater, Cole, W. F. M. Goss (1153), vol. 29 (1907-1908), p. 289
- Locomotive testing plants, W. F. M. Goss (1039), vol. 25 (1903-1904), p. 827
- Locomotive tests (1109), vol. 27 (1905-1906), p. 610
- Locomotive tests, analysis of, S. A. Reeve (1157), vol. 29 (1906-1907), p. 337
- Locomotive tests, report of committee on standard method of conducting (552), vol. 14 (1892-1893), p. 1312
- Locomotives, consolidation freight, road tests of, E. A. Hitchcock (1032), vol. 25 (1903-1904), p. 550
- Locomotives, efficiency of, W. F. Dixon (391), vol. 11 (1889-1890), p. 867
- Locomotives, electric, mechanical design of, A. F. Batchelder (1565), vol. 38 (1916-1917), p. 1021
- Locomotives, factors in selection of, in relation to economics of railway operation, O. S. Beyer, Jr. (1381), vol. 34 (1912-1913), p. 1287
- Locomotives, finishing staybolts and straight and taper bolts for, C. K. Lassiter (1279), vol. 32 (1910-1911), p. 353
- Locomotives, fuel consumption of, G. R. Henderson (1066), vol. 26 (1904-1905), p. 258
- Locomotives, handling at terminals, Frederic M. Whyte (1290b), vol. 32 (1910-1911), p. 661
- Locomotives, mechanical stokers for, F. H. Colvin (932), vol. 23 (1901-1902), p. 444
- Locomotives operating by total adhesion on curves of small radius, A. Mallet (532), vol. 14 (1892-1893), p. 648
- Locomotives, pulverized fuel for, John E. Muhlfeld (1566), vol. 38 (1916-1917), p. 1043
- Locomotives, safety valves for, F. M. Whyte (1231), vol. 31 (1909-1910), p. 105
- Locomotives, steam, of today (1448), vol. 30 (1914-1915), p. 483
- Locomotives, superheated steam on, H. H. Vaughan (1156), vol. 29 (1907-1908), p. 313
- Locomotives, testing in England (1033), vol. 25 (1903-1904), p. 589
- Lubricant, interesting experiment with a, Geo. W. Bissell (425), vol. 12 (1890-1891), p. 221
- Lubricants, measurement of durability of, J. E. Denton (404), vol. 11 (1889-1890), p. 1013
- Lubricants, mechanical significance of viscosity determination of, J. E. Denton (285), vol. 9 (1887-1888), p. 366
- Lubricants, special experiments with, J. E. Denton (433), vol. 12 (1890-1891), p. 405
- Lubricating car journals, cost of, L. S. Randolph (361), vol. 11 (1889-1890), p. 126
- Lubricating oils. See oils.
- Lubrication of journal bearings, laws of, M. D. Hersey (1483), vol. 37 (1915-1916), p. 187
- Lubrication of machinery, economy in, Geo. N. Comly (120), vol. 4 (1882-1883), p. 315
- Lubrication, theory of finance of, and on valuation of lubricants by consumers, R. H. Thurston (173), vol. 6 (1884-1885), p. 437

M

- Machine designing, education of intuition in, John T. Hawkins (247), vol. 8 (1886-1887), p. 458
- Machine details, nomenclature of, Oberlin Smith (47), vol. 2 (1881), p. 366
- Machine for testing physical properties of metals and alloys, Thos. Egleston (138), vol. 5 (1883-1884), p. 140
- Machine grinding operation of grinding wheels in, Geo. I. Alden (1446), vol. 36 (1914-1915), p. 451
- Machine members, under eccentric load, design of curved, Walter Rautenstrauch (1253), vol. 31 (1909-1910), p. 559
- Machine, process of assembling a small and intricate, Halcob Ellis (1312b), vol. 33 (1911-1912), p. 211
- Machine-screw thread sizes. See screw-thread sizes.
- Machine screws. See screws.
- Machine shop and foundry, power and light for, Forrest R. Jones (881), vol. 22 (1900-1901), p. 366
- Machine shop, economy of electric drive in, A. L. Delceuw (1276a), vol. 32 (1910-1911), p. 137
- Machine shop, electric drive versus shaft drive, in, C. H. Benjamin (738), vol. 18 (1896-1897), p. 861
- Machine shop practice, report of Sub-Committee on (1367), vol. 34 (1912-1913), p. 847
- Machine shop problem, Charles Day (1001), vol. 24 (1902-1903), p. 1302
- Machine-shop practice, use of surveying instrument in, C. C. Tyler (969), vol. 24 (1902-1903), p. 360
- Machine shop, slide rules for, as a part of the Taylor system of management, C. G. Barth (1010), vol. 25 (1903-1904), p. 49
- Machine shops, mechanical features of electric drive in, John Riddell (1276c), vol. 32 (1910-1911), p. 219
- Machine, simple difference, Geo. Richmond (517), vol. 14 (1892-1893), p. 310
- Machine-tool drives, gears for, John Parker (1415), vol. 35 (1913-1914), p. 785
- Machine-tool parts, cast iron for, Henry M. Wood (1416), vol. 35 (1913-1914), p. 799
- Machine tools, John E. Sweet (1014), vol. 25 (1903-1904), p. 100
- Machine tools, electric operation and automatic electric control, L. C. Brooks (1522), vol. 37 (1915-1916), p. 1183
- Machine tools, portable versus stationary, John Riddell (893), vol. 22 (1900-1901), p. 588
- Machine tools, standardization of, Carl G. Barth (1559), vol. 38 (1916-1917), p. 895
- Machine tools, strength in, C. T. Porter (8), vol. 1 (1880), p. 110
- Machine, wire-testing, convenient form of, Arthur L. Rice (751), vol. 19 (1897-1898), p. 71
- Machinery, American, at International exhibitions, T. R. Pickering (136), vol. 5 (1883-1884), p. 113
- Management, industrial, present state of the art of (1378), vol. 34 (1912-1913), p. 1131
- Management, modifying systems of, H. L. Gantt (1011), vol. 25 (1903-1904), p. 63
- Management, principles of, W. P. Barba (1513), vol. 37 (1915-1916), p. 909
- Management, shop, James M. Dodge (1115), vol. 27 (1905-1906), p. 720

- Management, shop, Fred W. Taylor (1003), vol. 24 (1902-1903), p. 1337
- Management, slide rules for the machine shop as a part of the Taylor system of, C. G. Barth (1010), vol. 25 (1903-1904), p. 49
- Management, topical discussion on (1573b), vol. 38 (1916-1917), p. 1220
- Manganese and other bronzes, elastic limit of, J. A. Capp (1283), vol. 32 (1910-1911), p. 507
- Manganese steel. See steel.
- Manufacture, graphical daily balance in, H. L. Gantt (1002), vol. 24 (1902-1903), p. 1322
- Manufacture, quantity, of small devices, F. P. Cox (1312c), vol. 33 (1911-1912), p. 233
- Marine engineering, epochs in, Geo. W. Melville (1076), vol. 26 (1904-1905), p. 456
- Marine engines and boilers. See engines.
- Marine producer gas power, C. L. Straub (1238), vol. 31 (1909-1910), p. 185
- Measurement, natural gas in large quantities, establishing a standard, Francis P. Fisher (1536), vol. 38 (1916-1917), p. 241
- Measurement of air in fan work, Charles H. Treat (1373), vol. 34 (1912-1913), p. 1019
- Measurements, standard, Geo. M. Bond (26), vol. 2 (1881), p. 81
- Measurements, water, with special reference to Schinzel ebomite water meter, Friedrich Lux (533), vol. 14 (1892-1893), p. 676
- Measures and weights, H. R. Towne (1134), vol. 28 (1906-1907), p. 845
- Measures and weights, rational solution of problem of, Sidney A. Reeve (962), vol. 24 (1902-1903), p. 184
- Measuring apparatus, liquid, Geo. B. Willcox (1114), vol. 27 (1905-1906), p. 711
- Measuring and mixing of crushed or powdered materials, E. N. Trump (1090), vol. 26 (1904-1905), p. 744
- Mechanical correctness, Charles A. Hague (15), vol. 1 (1880), p. 238
- Mechanical draft, W. R. Roney (604), vol. 15 (1893-1894), p. 1162
- Mechanical drawings, method of keeping, C. T. Porter (56), vol. 2 (1881), p. 576
- Mechanical engineer and the function of engineering society, F. R. Hutton (1164), vol. 29 (1907-1908), p. 627
- Mechanical engineer and the textile industry, H. L. Gantt (1282), vol. 32 (1910-1911), p. 499
- Mechanical engineer, his work and his policy, R. H. Thurston (92), vol. 4 (1882-1883), p. 75
- Mechanical engineering, course in, at the Massachusetts Institute of Technology, Gaetano Lanza (201), vol. 7 (1885-1886), p. 338
- Mechanical engineering, field of, A. L. Holley (2), vol. 1 (1880), p. 7
- Mechanical engineering, progress in, R. H. Thurston (50), vol. 2 (1881), p. 425
- Mechanical equipment used in the port of New Orleans, William von Phul (1535), vol. 38 (1916-1917), p. 207
- Mechanical integrator used in connection with spring dynamometer, M. H. Wickhorst (870), vol. 22 (1900-1901), p. 83
- Mechanical fluid, new, Chas. Wallace Hunt (588), vol. 15 (1893-1894), p. 751
- Mechanical plant of modern commercial building, W. H. Bryan (801), vol. 20 (1898-1899), p. 243
- Mechanical science, some refinements of, Ambrose Swasey (1052), vol. 26 (1904-1905), p. 44
- Mechanical stokers. See stokers.
- Mechanics and progress of mechanical science, 1824 to 1882, F. Fraley (68), vol. 3 (1882), p. 213
- Mechanics, experimental, Oberlin Smith (24), vol. 2 (1881), p. 55
- Mercury column, improved, D. N. Melvin (28), vol. 2 (1881), p. 99
- Mercury column, open, for high pressures, W. W. Bird (392), vol. 11 (1889-1890), p. 892
- Metal-cutting tools without clearance, James Hartness (1217), vol. 30 (1908-1909), p. 895
- Metal surfaces, comparative value of, for warming air, W. J. Baldwin (203), vol. 7 (1885-1886), p. 361
- Metallurgical furnaces. See furnaces.
- Metals, early experiments involving flow of, W. E. Ward (182), vol. 6 (1884-1885), p. 655
- Metals, hardness, or the workability of, W. J. Keep (878), vol. 22 (1900-1901), p. 293
- Metals, on the art of cutting, F. W. Taylor (1119), vol. 28 (1906-1907), p. 31
- Metals, oxidation of, Bower-Barff process, Wm. H. Weightman (180), vol. 6 (1884-1885), p. 628
- Metals, polishing, for examination with the microscope, A. Kingsbury (1237), vol. 31 (1909-1910), p. 181
- Meter, calibration of Worthington water, John A. Laird (708), vol. 18 (1896-1897), p. 134
- Meter, electric gas, C. C. Thomas (1257), vol. 31 (1909-1910), p. 655
- Meter, indicating steam, C. E. Sargent (1065), vol. 26 (1904-1905), p. 246
- Meter, rate-flow, H. C. Hayes (1458), vol. 36 (1914-1915), p. 707
- Meter, steam, Pitot tube as, G. F. Gebhardt (1255), vol. 31 (1909-1910), p. 601
- Meter, tilting, water, for purposes of experiment, J. C. Hoadley (134), vol. 5 (1883-1884), p. 63
- Meter, venturi, for boiler feed, tests on, C. M. Allen (1254), vol. 31 (1909-1910), p. 589
- Meters, liquid flow, of large capacity, laboratory for investigating and testing, W. S. Giele (1459), vol. 36 (1914-1915), p. 735
- Metric system, Coleman Sellers (4), vol. 1 (1880), p. 30
- Metric system, F. A. Halsey (971), vol. 24 (1902-1903), p. 397
- Metric system, report of committee appointed to discuss arguments in favor of and against (972), vol. 24 (1902-1903), p. 630
- Metric system versus duodecimal system, Geo. W. Colles (721), vol. 18 (1896-1897), p. 492
- Microscope in the workshop, W. A. Rogers (193), vol. 7 (1885-1886), p. 164
- Mill buildings, textile, vibration in, G. H. Perkins (1558), vol. 38 (1916-1917), p. 879
- Mill, continuous rod, of Trenton Iron Company, Wm. Hewitt (25), vol. 2 (1881), p. 71
- Mill floors, C. J. H. Woodbury (52), vol. 2 (1881), p. 480
- Milling cutter, development of a high speed, Wilfred Lewis and W. H. Taylor (1216), vol. 30 (1908-1909), p. 869
- Milling cutters and their efficiency, A. L. DeLeeuw (1313), vol. 33 (1911-1912), p. 245
- Milling cutters, and milling machines, efficiency tests of, A. L. DeLeeuw (1215), vol. 30 (1908-1909), p. 837
- Milling machine and milling cutters, efficiency tests of, A. L. DeLeeuw (1215), vol. 30 (1908-1909), p. 837
- Milling machine as substitute for planer in machine construction, John J. Grant (276), vol. 9 (1887-1888), p. 259
- Mills, fire protection of, C. J. H. Woodbury (43), vol. 2 (1881), p. 308
- Mineral wool as heat insulation for steam pipes, F. R. Hutton (72), vol. 3 (1882), p. 244
- Model experiments and the forms of empirical equations, E. Buckingham (1487), vol. 37 (1915-1916), p. 263
- Moisture in coal, determining, R. S. Hale (691), vol. 17 (1895-1896), p. 593
- Molding machine, Harris Tabor (494), vol. 13 (1891-1892), p. 537
- Molding machine, limitations of, E. H. Mumford (1177), vol. 29 (1907-1908), p. 999
- Molding machine without stripping plates, E. H. Memford (755), vol. 19 (1897-1898), p. 83
- Molding sand, A. E. Outerbridge (1170), vol. 29 (1907-1908), p. 885
- Motor car, railway, B. D. Gray (1149), vol. 29 (1907-1908), p. 217

Motor, truck, axle shaft for, John Younger (1482), vol. 37 (1915-1916), p. 151
 Motors, air, and air hammers; apparatus and method for testing, M. H. Wickhorst (1015), vol. 25 (1904-1905), p. 107
 Motors, alternating current, for variable speed, W. I. Slichter (988), vol. 24 (1902-1903), p. 1037
 Motors, hydraulic reaction, De Volson Wood (516), vol. 14 (1892-1893), p. 266

N

Natural gas. See gas.
 Naval engineering, late developments in, and efficiency of propulsive machinery, H. C. Dinger (1547), vol. 38 (1916-1917), p. 543
 Navy, needs of, H. Ashton Ramsay (253), vol. 8 (1886-1887), p. 574
 Nickel, carbon, and manganese steel, comparison of the properties of, before and after heat treatment, Robert R. Abbott (1476), vol. 37 (1915-1916), p. 39
 Nomenclature of machine details, Oberlin Smith (47), vol. 2 (1881), p. 366
 Non-condensing engines. See engines.
 Nozzles, and diverging tubes, best form of, A. F. Nagle (300), vol. 9 (1887-1888), p. 505
 Nozzles, steam, efficiency tests of, F. H. Sibley and T. S. Kemble (1256), vol. 31 (1909-1910), p. 617
 Nuts, strains produced by the excessive tightening of, A. Bement (993), vol. 24 (1902-1903), p. 1137

O

Oil-burning electric plant, fuel economy tests of, C. R. Weymouth (1213), vol. 30 (1908-1909), p. 775
 Oil, cotton-seed, manufacture of, Erwin W. Thompson (172), vol. 6 (1884-1885), p. 414
 Oil engines. See engines.
 Oil, kerosene, use of, in steam boilers, Lewis F. Lyne (275), vol. 9 (1887-1888), p. 247
 Oil test, comparative, W. F. Parish, Jr. (984), vol. 24 (1902-1903), p. 976
 Oil-testing machine, new, and some of its results, Albert Kingsbury (959), vol. 24 (1902-1903), p. 143
 Oil wells, compressed-air pumping systems of, E. M. Ivens (1243), vol. 31 (1909-1910), p. 311
 Oils, lubricating, measurement of friction of, C. J. H. Woodbury (7), vol. 1 (1880), p. 74; (163), vol. 6 (1884-1885), p. 136
 Open-hearth steel manufacture in United States, early history of, S. T. Wellman (913), vol. 23 (1901-1902), p. 78
 Ordnance Department as an engineering organization, Wm. Crozier (1140), vol. 29 (1907-1908), p. 65
 Ordnance for the land service, R. Birnie (1027), vol. 25 (1903-1904), p. 355
 Otto cycle, entropy analysis of, Sidney A. Reeve (961), vol. 24 (1902-1903), p. 171

P

Panama-Pacific international exposition, engineering features of, Guy L. Bayley (1490), vol. 37 (1915-1916), p. 351
 Panama-Pacific international exposition, mechanical engineering at, George W. Dickie (1491), vol. 37 (1915-1916), p. 413
 Patent license restrictions, Edwin J. Prindle (1390), vol. 35 (1913-1914), p. 111
 Patents, James W. See (777), vol. 19 (1897-1898), p. 616
 Patterns and drawings, indexing, Albert F. Hall (48), vol. 2 (1881), p. 378
 Patterns for repetition work, E. H. Berry (1176), vol. 28 (1907-1908), p. 961

Pavement, combination iron and oak, J. W. Cole (474), vol. 13 (1891-1892), p. 199
 Paying workmen, gift proposition for, Frank Richards (965), vol. 24 (1902-1903), p. 250
 Perpetual-inventory value. See inventory.
 Petroleum, crucible furnace for burning, W. E. Crane (571), vol. 15 (1893-1894), p. 307
 Petroleum, crude, use of in steam boilers, L. F. Lyne (350), vol. 10 (1888-1889), p. 761
 Photographs, enlarged, and blue prints, R. H. Thurston (308), vol. 9 (1887-1888), p. 696
 Photography industrial, S. Ashton Hand (1223), vol. 30 (1908-1909), p. 1087
 Photometric burner, experimental method of determining effective center of light emitted from, D. S. Jacobus (676), vol. 17 (1895-1896), p. 212
 Physical laws of methane gas, P. F. Walker (1461), vol. 36 (1914-1915), p. 781
 Piece rate system, step toward partial solution of labor problem, Fred W. Taylor (647), vol. 16 (1894-1895), p. 856
 Piece work, Frank Richards (1012), vol. 25 (1903-1904), p. 68
 Pipe and pipe threads, standard, report of committee on (226), vol. 8 (1886-1887), p. 29
 Pipe connections for steam engine indicators, W. F. M. Goss (684), vol. 17 (1895-1896), p. 398
 Pipe covering test, Geo. M. Brill (646), vol. 16 (1894-1895), p. 827
 Pipe coverings, steam, tests of, Geo. H. Barrus (952), vol. 23 (1901-1902), p. 791
 Pipe coverings, steam, heat insulating properties of commercial, L. B. McMillan (1514), vol. 27 (1915-1916), p. 921
 Pipe flanges. See flanges.
 Pipe, horizontal, distribution of moisture in steam when flowing through, D. S. Jacobus (652), vol. 16 (1894-1895), p. 1017
 Pipe orifices, experiments on water flow through, Horace Judd (1538), vol. 38 (1916-1917), p. 331
 Pipe, pressure in, due to stoppage of flowing liquid, Geo. M. Peek (834), vol. 21 (1899-1900), p. 255
 Pipe, standard, and pipe threads, Geo. M. Bond (199), vol. 7 (1885-1886), p. 311
 Pipe thread gages. See gages.
 Pipe unions, standard, report of committee on, (917), vol. 23 (1901-1902), p. 111
 Pipe unions, supplementary report of committee on standard (948), vol. 23 (1901-1902), p. 681
 Pipes, experiments on flow of steam through, R. C. Carpenter (803), vol. 20 (1898-1899), p. 342
 Pipes, flow of superheated steam in, E. H. Foster (1150), vol. 29 (1907-1908), p. 247
 Pipes, steam. See steam pipes.
 Pipes, steel tubes and cylinders, strength of, under internal fluid pressure, Reid T. Stewart (1352), vol. 34 (1912-1913), p. 297
 Piping, steam, and efficiency of steam plants, W. A. Pike (577), vol. 15 (1893-1894), p. 536
 Piston acceleration, graphical determination of, J. N. LeConte (947), vol. 23 (1901-1902), p. 676
 Piston packing, rational system of, S. W. Robinson (20), vol. 2 (1881), p. 19
 Piston packing ring, thickness of, I. H. Rutherford and F. R. Hutton (246), vol. 8 (1886-1887), p. 439
 Piston packing rings, friction of, in steam cylinders, J. E. Denton (327), vol. 10 (1888-1889), p. 392
 Piston rods and valve stems, packing for, L. F. Lyne (16), vol. 1 (1880), p. 241
 Piston rods, carbon contents of, as affecting their endurance under fatigue, Jos. E. Johnson (780), vol. 19 (1897-1898), p. 700
 Pistons, conical, rational method of checking, G. H. Shepard (1197), vol. 30 (1908-1909), p. 321
 Pitot tube, W. B. Gregory (1021), vol. 25 (1903-1904), p. 184
 Pitot tube, W. B. Gregory and E. W. Schoder (1199), vol. 30 (1908-1909), p. 351

- Pitot tube as a steam meter, G. F. Gebhardt (1255), vol. 31 (1909-1910), p. 601
- Pitot tube, some experiments with, on high and low air velocities, Frank H. Kneeland (1342), vol. 33 (1911-1912), p. 1137
- Pitot tubes for gas measurement, W. C. Rowse (1411), vol. 35 (1913-1914), p. 633
- Planer, milling machine as substitute, in machine construction, John J. Grant (276), vol. 9 (1887-1888), p. 259
- Planimeter, horsepower, E. J. Willis (658), vol. 16 (1894-1895), p. 1161
- Planimeter, polar, Chas. E. Emery (176), vol. 6 (1884-1885), p. 496
- Plunger, elevator plant, tests of, A. J. Herschmann (1128), vol. 28 (1906-1907), p. 633
- Pneumatic dispatch-tube system for rapid transportation of mails in cities, B. C. Batcheller (804), vol. 20 (1898-1899), p. 373
- Poppet valves. See valves.
- Porro prism field glass, W. R. Warner (926), vol. 23 (1901-1902), p. 313
- Portland cement. See cement.
- Powdered coal fuel, in industrial furnaces, an installation for, William Dalton and W. S. Quigley (1431b), vol. 36 (1914-1915), p. 109
- Powdered fuel. See fuel.
- Power and heat, comparative value of steam and hot water for transmitting, Chas. E. Emery (250), vol. 8 (1886-1887), p. 512
- Power and heat distribution in cement mills, L. L. Griffiths (1311c), vol. 33 (1911-1912), p. 165
- Power and light for the machine shop and foundry, Forrest R. Jones (881), vol. 22 (1900-1901), p. 366
- Power and machinery, economy by subdivision in installation and operation of, under varying demand, Julius L. Hornig (112), vol. 4 (1882-1883), p. 233
- Power and steam; commercial determination of costs, Henry R. Towne (255), vol. 8 (1886-1887), p. 617
- Power, cost of, in non-condensing steam engines, Chas. E. Emery (319), vol. 10 (1888-1889), p. 233
- Power development at the high dam between Minneapolis and St. Paul, Adolph F. Meyer (1437), vol. 36 (1914-1915), p. 255
- Power development at Niagara Falls, some mechanical features of, Coleman Sellers (787), vol. 19 (1897-1898), p. 839
- Power distribution electric, H. C. Spaulding (472), vol. 13 (1891-1892), p. 157
- Power, electric. See electric power.
- Power equipment for general factory purposes, electrical, D. C. Jackson (746), vol. 18 (1896-1897), p. 1047
- Power forging with special reference to steam-hydraulic forging presses, Barthold Gerdau and George Mesta (1322), vol. 33 (1911-1912), p. 409
- Power installation of the Tennessee River Company at Hale's Bar, Tenn., Thos. E. Murray (1105), vol. 27 (1905-1906), p. 520
- Power losses in the transmission machinery of central stations, W. S. Aldrich (585), vol. 15 (1893-1894), p. 705
- Power, measurement of, Thomas Gray (493), vol. 13 (1891-1892), p. 531
- Power, mechanical, experiments in mechanics, overhauling of, J. B. Webb (328), vol. 10 (1888-1889), p. 402
- Power of ocean waves, utilization of, A. W. Stahl (491), vol. 13 (1891-1892), p. 438
- Power-plant efficiency, factors in, Victor J. Azbe (1553), vol. 38 (1916-1917), p. 717
- Power plant, hydraulic, at the Henry Ford farms, Mark A. Replogle (1517), vol. 37 (1915-1916), p. 1043
- Power plant of the tall office building, J. H. Wells (1036), vol. 25 (1903-1904), p. 685; R. P. Bolton (1045), vol. 25 (1903-1904), p. 1011; S. H. Bunnell (1060), vol. 26 (1904-1905), p. 159
- Power plant of the Massachusetts General Hospital, Boston, Mass., F. W. Dean (882), vol. 22 (1900-1901), p. 392
- Power plant of a university, E. A. Darling (815), vol. 20 (1898-1899), p. 663
- Power plant of Detroit Edison Company, Conners Creek, C. F. Hirschfeld (1519), vol. 37 (1915-1916), p. 1085
- Power-plant operating costs, standardization of, Walter N. Polakov (1549), vol. 38 (1916-1917), p. 581
- Power plant, producer gas, J. R. Bibbins (1126), vol. 28 (1906-1907), p. 549
- Power plants, electric. See electric power plants.
- Power plants, steam and gas, cooling towers for, J. R. Bibbins (1259), vol. 31 (1909-1910), p. 725
- Power plants, street railway, performance of, Wm. A. Pike and T. W. Hugo (546), vol. 14 (1892-1893), p. 1082
- Power plants, water, surge tank in, Raymond D. Johnson (1204), vol. 30 (1908-1909), p. 443
- Power press problems, Oberlin Smith (271), vol. 9 (1887-1888), p. 161
- Power required to overcome frictional resistance of engine and shafting in mills and its cost, J. T. Henthorn (174), vol. 6 (1884-1885), p. 461
- Power service in the foundry, A. D. Williams (1171), vol. 29 (1907-1908), p. 877
- Power, steam, reduction in cost of, F. W. Dean (764), vol. 19 (1897-1898), p. 301
- Power test committee, report of (1526), vol. 37 (1915-1916), p. 1273
- Power transmitted by a belt, relation between initial tension and, F. L. Emory (808), vol. 20 (1898-1899), p. 466
- Power transmitted, variation of belt tensions with, Wm. S. Aldrich (797), vol. 20 (1898-1899), p. 136
- Power transmission and auxiliary engines on naval vessels, G. W. Dickie (762), vol. 19 (1897-1898), p. 233
- Power transmission by belting, Gaetano Lanza (202), vol. 7 (1885-1886), p. 347; Wilfred Leurs (213), vol. 7 (1885-1886), p. 549
- Power transmission by friction driving, W. F. M. Goss (1180), vol. 29 (1907-1908), p. 1093
- Power transmission by gearing, Wilfred Lewis (198), vol. 7 (1885-1886), p. 273
- Power transmission of, by leather belting, Carl G. Barth (1230), vol. 31 (1909-1910), p. 29
- Power-transmission machinery, of central stations, losses in, W. S. Aldrich (585), vol. 15 (1893-1894), p. 705
- Power-transmission plants, regulation of high-pressure water wheels for, Geo. R. Henry, Jr. (1111), vol. 27 (1905-1906), p. 662
- Power transmission, variable-speed, George H. Barrus and Chas. M. Manly (1335), vol. 33 (1911-1912), p. 851
- Power transmission, variable speed, H. C. Spaulding (524), vol. 14 (1892-1893), p. 478
- Power, water. See water power.
- Precision grinding. See grinding.
- Premium plan of paying for labor, F. A. Halsey (449), vol. 12 (1890-1891), p. 755
- Preparedness, industrial, organizing for, Spencer Miller (1532), vol. 38 (1916-1917), p. 47
- Pressure drop through poppet valves, Chas. E. Lucke (1099), vol. 27 (1905-1906), p. 232
- Pressure gage. See gage.
- Pressure in pipe due to stoppage of flowing liquid, Geo. M. Peek (834), vol. 21 (1899-1900), p. 255
- Pressure-temperature curve of sulphurous anhydride (SO₂), E. F. Miller (1020), vol. 25 (1903-1904), p. 176
- Pressure-temperature relations of saturated steam, Lionel S. Maks (1318), vol. 33 (1911-1912), p. 351
- Pressures and temperatures in free expansion, A. Borosdy and R. Campbell Cairncross (1059), vol. 26 (1904-1905), p. 114
- Pressures, high hydrostatic, and their application to compressing liquids, E. H. Stillman (844), vol. 21 (1899-1900), p. 439
- Pressures, high, open mercury column for, W. W. Bird (392), vol. 11 (1889-1890), p. 892

- Pressures of 10,000 lb. per sq. in. and over, apparatus for accurately measuring, D. S. Jacobus (745), vol. 18 (1896-1897), p. 1041
- Pressures, comparison of mean effective on simultaneous cards taken by different indicators, D. S. Jacobus (570), vol. 15 (1893-1894), p. 277
- Prime movers, potential efficiency of, C. V. Kerr (1042), vol. 25 (1903-1904), p. 920
- Printing press, plea for, in mechanical engineering schools, John T. Hawkins (290), vol. 9 (1887-1888), p. 403
- Producer gas. See gas.
- Producer, gas, loss of fuel weight in a freshly charged, N. T. Harrington (1205), vol. 30 (1908-1909), p. 511
- Producer, gas, experiments with North Dakota lignite in, Calvin H. Crouch (1365), vol. 34 (1912-1913), p. 795
- Producer, gas, for bituminous fuel, O. C. Berry (1560), vol. 38 (1916-1917), p. 923
- Producer gas power, marine, C. L. Straub (1238), vol. 31 (1909-1910), p. 185
- Producer gas power plant, J. R. Bibbins (1126), vol. 28 (1906-1907), p. 549
- Producer gas power plant, operation of a small, C. W. Obert (1239), vol. 31 (1909-1910), p. 209
- Producers, bituminous gas, J. R. Bibbins (1264), vol. 31 (1909-1910), p. 877
- Producers, gas, with by-product recovery, Arthur H. Lymn (1524), vol. 37 (1915-1916), p. 1231
- Producers, suction gas, testing with a Koerting ejector, C. M. Garland and A. P. Kratz (1263), vol. 31 (1909-1910), p. 831
- Production and costs, relation between, H. L. Gantt (1479), vol. 37 (1915-1916), p. 109
- Productive capacity a measure of value of an industrial property, H. L. Gantt (1578), vol. 38 (1916-1917), p. 1303
- Profit sharing, problem in, William Kent (256), vol. 8 (1886-1887), p. 630
- Propeller efficiency, limit of, as dependent on the surface form of the propeller, W. F. Durand (507), vol. 14 (1892-1893), p. 65
- Properties of steam, tables of, V. Dwellshauvers-Dery (359), vol. 11 (1889-1890), p. 72
- Propulsion, jet, J. B. Webb (455), vol. 12 (1890-1891), p. 904
- Propulsive machinery, efficiency of, and late developments in naval engineering, H. C. Dinger (1547), vol. 38 (1916-1917), p. 543
- Psychrometric formulae, rational, Willis H. Carrier (1340), vol. 33 (1911-1912), p. 1005
- Public-utility valuation, John H. Gray (1575), vol. 38 (1916-1917), p. 1247
- Publicity and the engineer, C. E. Drayer (1452), vol. 36 (1914-1915), p. 573
- Pulley faces, tractive force of leather belts on, Scott A. Smith (351), vol. 10 (1888-1889), p. 765
- Pulleys and fly wheels, stresses in rims and rim joints of, Gaetano Lanza (621), vol. 16 (1894-1895), p. 208
- Pulleys, cone, diameters of, C. A. Smith (320), vol. 10 (1888-1889), p. 269
- Pulsometer, test of, De Volson Wood (475), vol. 13 (1891-1892), p. 211
- Pulverized coal, in the cement industry, R. C. Carpenter (1431a), vol. 36 (1914-1915), p. 85
- Pulverized coal for steam making, F. R. Low (1431c), vol. 36 (1914-1915), p. 123
- Pulverized fuel. See fuel.
- Pump cylinders. See cylinders.
- Pump design, turbine, influence of disk friction on, F. zur Nedden (1478), vol. 37 (1915-1916), p. 83
- Pump, receiving suction water under pressure, tests of, R. Van A. Norris (513), vol. 14 (1892-1893), p. 168
- Pump rods, deep-well, experiences with, G. W. Bissell (816), vol. 20 (1898-1899), p. 725
- Pump, rotary, tests of, W. B. Gregory (1132), vol. 28 (1906-1907), p. 745
- Pump valves and valve areas. See valves.
- Pumps, centrifugal and reciprocating, relative efficiency of, W. O. Webber (214), vol. 7 (1885-1886), p. 598
- Pumps, centrifugal, and their efficiencies, Wm. O. Webber (274), vol. 9 (1887-1888), p. 228
- Pumps, centrifugal, some types of, Wm. O. Webber (1091), vol. 26 (1904-1905), p. 764
- Pumps, centrifugal, tests of, W. B. Gregory (877), vol. 22 (1900-1901), p. 262
- Pumps, centrifugal, tests of, and calibration of weir at the Bridgeport Pumping Station, Chicago, Ill., R. C. Carpenter (763), vol. 19 (1897-1898), p. 255
- Pumps, comparative value of different arrangements of suction air chambers on, F. M. Wheeler (884), vol. 22 (1900-1901), p. 439
- Pumps, direct-acting steam, theory of, D. Guelbaum (561), vol. 15 (1893-1894), p. 75
- Pumps, fire, Ezra E. Clark (1424), vol. 35 (1913-1914), p. 951
- Pumps, high-pressure fire-service, of Manhattan Borough, R. C. Carpenter (1251), vol. 31 (1909-1910), p. 437
- Pumps, rotary, John T. Wilkin (970), vol. 24 (1902-1903), p. 385
- Pumping and winding machinery in the anthracite coal regions of Pennsylvania, Howell Green (108), vol. 4 (1882-1883), p. 217
- Pumping engine. See engine.
- Pumping plant, large reclamation, design and test of, G. C. Noble (1548), vol. 38 (1916-1917), p. 563
- Pumping plants, low-lift, evolution of, in the Gulf coast country, W. B. Gregory (1534), vol. 38 (1916-1917), p. 115
- Pumping systems, compressed air for oil wells, E. M. Ivens (1243), vol. 31 (1909-1910), p. 311
- Punch and riveter frames made of cast iron, strength of, A. L. Jenkins (1278), vol. 32 (1910-1911), p. 311
- Punching machinery, pressure-recording indicator for, Gardner C. Anthony (1319), vol. 33 (1911-1912), p. 369
- Pyrometer, air, new recording, Wm. H. Bristol (874), vol. 22 (1900-1901), p. 143
- Pyrometer, thermo-electric, and compensator, Wm. H. Bristol (1106), vol. 27 (1905-1906), p. 552
- Pyrometer, use of, as calorimeter, for high temperatures, J. C. Hoadley (23), vol. 2 (1881), p. 42

R

- Rack railways. See railways.
- Rail cambering arrangement of the Lackawanna Iron and Coal Company, W. K. Seaman (93), vol. 4 (1882-1883), p. 106
- Railroad economics, S. W. Robinson (55), vol. 2 (1881), p. 538
- Railroad track scale, W. Wallace Boyd (1434), vol. 36 (1914-1915), p. 211
- Railroads, elevated and rapid transit, F. E. Galloupe (189), vol. 7 (1885-1886), p. 81
- Railroads, electric, W. E. Hall (390), vol. 11 (1889-1890), p. 839
- Rails, steel, mechanical elimination of seams in, Robert W. Hunt (1466), vol. 36 (1914-1915), p. 933
- Railway car, axles, strength of, L. S. Randolph (623), vol. 16 (1894-1895), p. 239
- Railway power station, electric, giving electric light service, tests of, D. C. Jackson and A. W. Richter (657), vol. 16 (1894-1895), p. 1142
- Railway electrification. See electrification.
- Railway motor car, B. D. Gray (1149), vol. 29 (1907-1908), p. 217
- Railway operation, factors in selection of locomotives in relation to economics of, O. S. Beyer, Jr. (1381), vol. 34 (1912-1913), p. 1287
- Railway plant, electric. See electric.
- Railway testing, portable accelerometer for, F. B. Corey (927), vol. 23 (1901-1902), p. 327
- Railways, rack, experiences in operation of, Albert Schneider (536), vol. 14 (1892-1893), p. 708

- Rate-flow meter. See meter.
- Reciprocating motion, graphical analysis of, Oberlin Smith (371), vol. 11 (1889-1890), p. 260
- Reciprocating parts of high-speed engines, formulae and tables for calculating effect of, Geo. I. Alden (234), vol. 8 (1886-1887), p. 191
- Recorder for tests of materials, pocket, Gus. C. Henning (736), vol. 18 (1896-1897), p. 923
- Recording apparatus, autographic, for use in testing materials, Thomas Gray (498), vol. 13 (1891-1892), p. 633
- Recording device for testing machines, G. W. Bissell (667), vol. 17 (1895-1896), p. 76
- Recording pressure gage, W. H. Bristol (368), vol. 11 (1889-1890), p. 225
- Refrigerating machine, of today, C. Linde (554), vol. 14 (1892-1893), p. 1414
- Refrigerating machine, 35-ton, ammonia absorption type, J. E. Denton (353), vol. 10 (1888-1889), p. 792
- Refrigerating machine, 75-ton, ammonia compression type, J. E. Denton (432), vol. 12 (1890-1891), p. 326
- Refrigerating machines, experimental measurements of performance of, J. E. Denton and D. S. Jacobus (492), vol. 13 (1891-1892), p. 507
- Refrigerating plant, test of, De Volson Wood (389), vol. 11 (1889-1890), p. 830
- Refrigerating plant, work done daily, and its cost, Francis H. Boyer (707), vol. 18 (1896-1897), p. 127
- Refrigeration process and its proper place in thermodynamics, Geo. Richmond (514), vol. 14 (1892-1893), p. 183
- Refrigeration, standard tonnage basis for (1055), vol. 26 (1904-1905), p. 64
- Refrigeration, standard unit of, J. C. Bertach (1025), vol. 25 (1903-1904), p. 292
- Refrigeration, standard unit of, F. E. Matthews (1079), vol. 26 (1904-1905), p. 502
- Refuse, burning of, Geo. Watson (1048), vol. 25 (1903-1904), p. 1074
- Refuse destruction by burning and utilization of heat generated, C. N. Russell (1044), vol. 25 (1903-1904), p. 982
- Regenerator in a hot-air engine, effect of varying the weight of metal in, G. W. Bissell (587), vol. 15 (1893-1894), p. 744
- Regulator, automatic, for heating apparatus, J. T. Hawkins (292), vol. 9 (1887-1888), p. 431
- Regulator, for air compressors, Ragnar Wikander (1460), vol. 36 (1914-1915), p. 759
- Reheater, description of improved forms of steam separator and steam jacket, Chas. T. Porter (618), vol. 16 (1894-1895), p. 137
- Reheaters in multiple-cylinder engines, R. H. Thurston (858), vol. 21 (1899-1900), p. 893
- Reinforced-concrete beams. See beams.
- Reinforced-concrete factory buildings. See factory.
- Relations between the purchaser, the engineer and the manufacturer, W. H. Bryan (779), vol. 19 (1897-1898), p. 686
- Resistance, moment of, C. V. Kerr (715), vol. 18 (1896-1897), p. 314
- Retarders in fire tubes of steam boilers, Jay M. Whitham (687), vol. 17 (1895-1896), p. 450
- Rings, elastic, flexure of, De Volson Wood (456), vol. 12 (1890-1891), p. 911
- River steamboat practice in the West, Ohio and Mississippi Rivers, J. M. Sweeney (305), vol. 9 (1887-1888), p. 645
- River steamboat practice, western, W. H. Bryan (683), vol. 17 (1895-1896), p. 386
- Riveted joints, longitudinal, of steam boiler shells, J. H. Cooper (348), vol. 10 (1888-1889), p. 707
- Rock drill, F. A. Halsey (156), vol. 6 (1884-1885), p. 71
- Rod-rolling mills. See mills.
- Rolled-cast steel car wheels, Jacob Reese (42), vol. 2 (1881), p. 300
- Rolling mill, American, evolution of, Robert W. Hunt (466), vol. 13 (1891-1892), p. 45
- Rolling mill, first in America, Wm. H. Harrison (29), vol. 2 (1881), p. 104
- Rolling-mill flywheels, John Fritz (823), vol. 20 (1898-1899), p. 944
- Rolling mills, rod, and their development in America, F. H. Daniels (528), vol. 14 (1892-1893), p. 583
- Rolling mill, some landmarks in history of, C. H. Morgan (868), vol. 22 (1900-1901), p. 31
- Roof construction, ferroinclave, A. E. Brown (1121), vol. 28 (1906-1907), p. 393
- Roof. See factory.
- Rope driving, Chas. Wallace Hunt (426), vol. 12 (1890-1891), p. 230
- Rope driving, efficiency of, E. H. Ahara (1409), vol. 35 (1913-1914), p. 567
- Rotary pumps. See pumps.
- Rules and methods, report of special committee (978), vol. 24 (1902-1903), p. 889
- Running-shed practice (locomotive) English, Cecil W. Paget (1290a), vol. 32 (1910-1911), p. 633
- Safeguarding of life in theatres, John R. Freeman (1096), vol. 27 (1905-1906), p. 71
- Safety, from standpoint of manufacturer, Melville W. Mix (1511), vol. 37 (1915-1916), p. 893
- Safety, industrial, and principles of management, W. P. Barba (1513), vol. 37 (1915-1916), p. 909
- Safety principles, standardization of, Carl M. Hansen (1510), vol. 37 (1915-1916), p. 867
- Safety valves. See valves.
- Salt manufacture, Geo. B. Willcox (1222), vol. 30 (1908-1909), p. 1065
- Sand-blasting machine, tests of, Wm. T. Magruder (1333), vol. 33 (1911-1912), p. 821
- Sash, window, heat transmission through various types of, Arthur N. Sheldon (1557), vol. 38 (1916-1917), p. 857
- Saturated and superheated ammonia, properties of, Wm. E. Mosher (1364), vol. 34 (1912-1913), p. 739
- Saturation curve as reference line for indicator diagrams, R. C. Carpenter (592), vol. 15 (1893-1894), p. 904
- Sawtooth roofs for factories, K. C. Richmond (1122), vol. 28 (1906-1907), p. 413
- Sawtooth skylight in factory roof construction, F. S. Hinds (1120), vol. 28 (1906-1907), p. 433
- Scale, prevention of, in boilers, Allen H. Babcock (1520), vol. 37 (1915-1916), p. 1105
- Scale, cumulative errors of a graduated, W. A. Rogers (564), vol. 15 (1893-1894), p. 127
- Schools, mechanical engineering, plea for printing press in, John T. Hawkins (290), vol. 9 (1887-1888), p. 403
- Science in its relation to engineering, John A. Brashear (1495), vol. 37 (1915-1916), p. 531
- Screw bolt, some experiments with, James McBride (450), vol. 12 (1890-1891), p. 781
- Screw die for the turret lathe, James Hartness (753), vol. 19 (1897-1898), p. 77
- Screw machines and lathes, automatic mechanical control of, L. C. Brooks (1521), vol. 37 (1915-1916), p. 1143
- Screw problem, additional contribution to, W. A. Rogers (446), vol. 12 (1890-1891), p. 725
- Screw problem, practical solution of, W. A. Rogers (146), vol. 5 (1883-1884), p. 216
- Screw propulsion, improved method, John B. Root (51), vol. 2 (1881), p. 453
- Screw machine, thread sizes, proposed standard for, C. C. Tyler (944), vol. 23 (1901-1902), p. 603
- Screw threads. See threads.
- Screws, effective area of, D. S. Jacobus (405), vol. 11 (1889-1890), p. 1028
- Screws, experiments on friction of, Albert Kingsbury (669), vol. 17 (1895-1896), p. 96
- Screws, machine, note on heads of, H. G. Reist (1077), vol. 26 (1904-1906), p. 477

- Screws, machine, report of committee on standard proportions for (1142), vol. 29 (1907-1908), p. 99
- Selling price, method of determining, H. M. Lane (711), vol. 18 (1896-1897), p. 221
- Separator and superheater, "Potter" mesh, F. A. Schebbler (930), vol. 23 (1901-1902), p. 387
- Separator, steam, test of, F. L. Emory (810), vol. 20 (1898-1899), p. 485
- Sewage sludge, handling of, Geo. S. Webster (1453), vol. 36 (1914-1915), p. 587
- Shaft governors. See governors.
- Shaft-drive, electric-drive versus, in machine shop, C. H. Benjamin (738), vol. 18 (1896-1897), p. 861
- Shafting, frictional resistance of, in engineering establishments, Samuel Webber (191), vol. 7 (1885-1886), p. 138
- Shafting, strength of, subjected to both twisting and bending, Gaetano Lanza (230), vol. 8 (1886-1887), p. 130
- Shear, flying, V. E. Edwards (933), vol. 23 (1901-1902), p. 458
- Shop accounting, method of, to determine shop cost and minimum selling price, H. M. Lane (739), vol. 18 (1896-1897), p. 892
- Shop construction, reinforced concrete applied to, E. N. Hunting (1102), vol. 27 (1905-1906), p. 373
- Shop construction, suggestions for, F. A. Scheffler (1013), vol. 25 (1903-1904), p. 93
- Shop management, Fred W. Taylor (1003), vol. 24 (1902-1903), p. 1337
- Shop management, James M. Dodge (1115), vol. 27 (1905-1906), p. 720
- Shop-order system of accounts, Henry Metcalfe (209), vol. 7 (1885-1886), p. 440
- Shop, relation of drawing office to, in manufacturing, A. W. Robinson (596), vol. 15 (1893-1894), p. 965
- Shop systems and drafting room, Frederick O. Ball (909), vol. 22 (1900-1901), p. 1040
- Simple and compound engines. See engines.
- Slide rules for the machine shop as a part of the Taylor system of management, C. G. Barth (1010), vol. 25 (1903-1904), p. 49
- Smoke abatement, topical discussion on (1296), vol. 32 (1910-1911), p. 1109
- Smoke and its abatement, Chas. H. Benjamin (1089), vol. 26 (1904-1905), p. 713
- Snow removal (1450), vol. 36 (1914-1915), p. 551
- Specific heat. See heat.
- Specifications for factory timbers, F. J. Hoxie (1407), vol. 35 (1913-1914), p. 527
- Speed cones, design of, J. J. Guest (855), vol. 21 (1899-1900), p. 832
- Speed recorder, electric, Geo. H. Barrus (286), vol. 9 (1887-1888), p. 377
- Spring tables, G. R. Henderson (680), vol. 17 (1895-1896), p. 340
- Springs, calibrated cold, constants for correcting indicator, R. C. Carpenter, L. S. Marks and S. H. BarnacloUGH (574), vol. 15 (1893-1894), p. 454
- Springs, graphical method of designing, G. R. Henderson (613), vol. 16 (1894-1895), p. 92
- Springs, helical, John W. Cloud (142), vol. 5 (1883-1884), p. 173
- Springs, spiral, Oberlin Smith (122), vol. 4 (1882-1883), p. 335
- Springs, spiral, experiments on, C. H. Benjamin (925), vol. 23 (1901-1902), p. 298
- Sprinklers, automatic, sensitiveness of, A. F. Nagle (383), vol. 11 (1889-1890), p. 699
- Spruce columns, tests of strength of, Gaetano Lanza and E. F. Miller (609), vol. 16 (1894-1895), p. 56
- Standard section lining in mechanical drawing, Frank Van Vleck (268), vol. 9 (1887-1888), p. 107
- Standards, general equipment, Jas. W. See (337), vol. 10 (1888-1889), p. 542
- Staybolts and straight and taper bolts for locomotives, finishing, C. K. Lassiter (1279), vol. 32 (1910-1911), p. 353
- Staybolts, braces and flat surfaces, R. S. Hale (1061), vol. 26 (1904-1905), p. 177
- Staybolts, flexible, new departure in, H. V. Wille (1246), vol. 31 (1909-1910), p. 359
- Staybolts, locomotive, bending tests of, Francis J. Cole (778), vol. 19 (1897-1898), p. 662
- Steam actuated valve gear, W. H. Collier (1092), vol. 26 (1904-1905), p. 801
- Steam and air, flow of, through orifices, Herbert B. Reynolds (1555), vol. 38 (1916-1917), p. 799
- Steam and gas power plants, cooling towers for, J. R. Bibbins (1259), vol. 31 (1909-1910), p. 725
- Steam and hot water, comparative value of, for transmitting heat and power, Chas. E. Emery (250), vol. 8 (1886-1887), p. 512
- Steam and power; commercial determination of costs, Henry R. Towne (255), vol. 8 (1886-1887), p. 617
- Steam and water, expansion of, without transfer of heat, A. Faber Du Faur (70), vol. 3 (1882), p. 223
- Steam and water power, comparative cost of, Chas. H. Manning (332), vol. 10 (1888-1889), p. 499
- Steam and water power, cost of, Chas. T. Main (360), vol. 11 (1889-1890), p. 108
- Steam, apparatus for measuring and registering quantities of, passing through conduits, or utilized in steam engines, Franz Seiler (537), vol. 14 (1892-1893), p. 751
- Steam boiler, shells, longitudinal riveted joints of, J. H. Cooper (348), vol. 10 (1888-1889), p. 707
- Steam boilers. See boilers.
- Steam calorimeter. See calorimeter.
- Steam consumption of engines at various speeds, J. E. Denton and D. S. Jacobus (349), vol. 10 (1888-1889), p. 722
- Steam distribution, new method of, in compound engines, F. M. Rites (599), vol. 15 (1893-1894), p. 1074
- Steam, distribution of, in Strong locomotive, F. W. Dean (304), vol. 9 (1887-1888), p. 556; (346), vol. 10 (1888-1889), p. 687
- Steam, distribution of moisture in, when flowing through horizontal pipe, D. S. Jacobus (652), vol. 16 (1894-1895), p. 1017
- Steam drums, and design of fire tube boilers, F. W. Dean (1500), vol. 37 (1915-1916), p. 619
- Steam drums, corrosion of, James McBride (600), vol. 15 (1893-1894), p. 1087
- Steam, dry, identification of, J. E. Denton (326), vol. 10 (1888-1889), p. 340
- Steam engine. See engine, engines.
- Steam, experiments on flow of through pipes, R. C. Carpenter (803), vol. 20 (1898-1899), p. 342
- Steam, flow of, in a tube, C. H. Peabody (322), vol. 10 (1888-1889), p. 316
- Steam, flow of, through orifices, C. H. Peabody and L. H. Kunhardt (363), vol. 11 (1889-1890), p. 187
- Steam generating apparatus, efficiency of, A. Bement (1086), vol. 26 (1904-1905), p. 619
- Steam generating apparatus, more exact methods for determining efficiency of, A. Bement (1074), vol. 26 (1904-1905), p. 418
- Steam-generating by waste heat, Arthur D. Pratt (1550), vol. 38 (1916-1917), p. 599
- Steam, generation and utilization of, by the Lykens Valley Coal Company, R. V. Norris (794), vol. 20 (1898-1899), p. 50
- Steam-heated surfaces, protection of, Chas. L. Norton (782), vol. 19 (1897-1898), p. 729
- Steam heating plant, with hot water, comparative test of, R. C. Carpenter (395), vol. 11 (1889-1890), p. 918
- Steam, highly superheated, design of engines for use of, Max E. R. Toltz (1179), vol. 29 (1907-1908), p. 1069
- Steam-hydraulic forging presses. See forging presses.
- Steam jacket, authorities on, R. H. Thurston (435), vol. 12 (1890-1891), p. 462
- Steam jacket, effect of, on cylinder condensation, W. W. Bird (453), vol. 12 (1890-1891), p. 873

- Steam jacket, reheater, steam separator, description of improved forms of, Chas. T. Porter (618), vol. 16 (1894-1895), p. 137
- Steam jacket, theory of, current practice, R. H. Thurston (590), vol. 15 (1893-1894), p. 779
- Steam jackets, effect of, on high-speed engines, R. C. Carpenter (523), vol. 14 (1892-1893), p. 426
- Steam jackets, of the Pawtucket pumping engine, influence of, D. S. Jacobus (406), vol. 11 (1889-1890), p. 1038
- Steam jackets of the Pawtucket pumping engine, influence of, William Kent (473), vol. 13 (1891-1892), p. 176
- Steam jackets, influence of on the Pawtucket pumping engine, J. E. Denton (374), vol. 11 (1889-1890), p. 328
- Steam locomotives. See locomotives.
- Steam main, swiveling joint for a 16-in. high-pressure, R. E. Curtis (934), vol. 23 (1901-1902), p. 469
- Steam meter. See meter.
- Steam packings, friction of, C. H. Benjamin (837), vol. 21 (1899-1900), p. 292
- Steam-pipe coverings. See pipe covering.
- Steam pipes, experiments upon conducting coverings for, J. M. Ordway (145), vol. 5 (1883-1884), p. 212
- Steam pipes, experiments with non-conducting coverings for, J. M. Ordway (135), vol. 5 (1883-1884), p. 73
- Steam pipes, method of manufacture of large, C. H. Manning (578), vol. 15 (1893-1894), p. 571
- Steam pipes, mineral wool used as insulation for, F. R. Hutton (72), vol. 3 (1882), p. 244
- Steam pipes, non-conducting coverings for, J. M. Ordway (164), vol. 6 (1884-1885), p. 168
- Steam pipes, water hammer in, R. H. Thurston (127), vol. 4 (1882-1883), p. 404
- Steam piston packing, new principle in, John E. Sweet (266), vol. 9 (1887-1888), p. 91
- Steam plant of the White motor car, R. C. Carpenter (1127), vol. 28 (1906-1907), p. 579
- Steam plants, steam piping and efficiency of, W. A. Pike (577), vol. 15 (1893-1894), p. 536
- Steam power plant and gas producer, experiments with North Dakota lignite in, Calvin H. Crouch (1305), vol. 34 (1912-1913), p. 795
- Steam power plants, graphic methods of analysis in design and operation of, R. J. S. Pigott (1552), vol. 38 (1916-1917), p. 687
- Steam power, reduction in cost of, F. W. Dean (764), vol. 19 (1897-1898), p. 301
- Steam pressure, probable limit of, in marine engines and boilers, Chas. E. Emery (248), vol. 8 (1886-1887), p. 472
- Steam pressures, higher, Robert Cramer (1499), vol. 37 (1915-1916), p. 597
- Steam, "promise and potency" of high-pressure, R. H. Thurston (710), vol. 18 (1896-1897), p. 160
- Steam, proper method of expansion of, and regulation of engine, R. H. Thurston (45), vol. 2 (1881), p. 346
- Steam, properties of, R. C. H. Heck (1402), vol. 35 (1913-1914), p. 391
- Steam pumps, direct-acting. See pumps.
- Steam radiator, new graduating, J. T. Hawkins (522), vol. 14 (1892-1893), p. 401
- Steam reaction wheel, performance of, J. B. Webb (454), vol. 12 (1890-1891), p. 888
- Steam roads, electric railway as applied to, B. J. Dashiell, Jr. (485), vol. 13 (1891-1892), p. 359
- Steam safety valves. See valves.
- Steam, saturated, pressure-temperature relations of, Leonel S. Marks (1318), vol. 33 (1911-1912), p. 351
- Steam, saturated, specific volume of, C. H. Peabody (1244), vol. 31 (1909-1910), p. 333
- Steam, saturated, total heat of, H. N. Davis (1212), vol. 30 (1908-1909), p. 741
- Steam separator, description of improved forms of, steam jacket and reheater, Chas. T. Porter (618), vol. 16 (1894-1895), p. 137
- Steam separator, test of, F. L. Emory (810), vol. 20 (1898-1899), p. 485
- Steam, some properties of, R. C. H. Heck (1245), vol. 31 (1909-1910), p. 345
- Steam stamp, notes on, F. G. Coggin (170), vol. 6 (1884-1885), p. 370
- Steam, substitutes for, G. H. Babcock (220), vol. 7 (1885-1886), p. 680
- Steam, superheated, Ernest H. Foster (906), vol. 22 (1900-1901), p. 939
- Steam, superheated, entropy lines of, A. M. Greene (1152), vol. 29 (1907-1908), p. 277
- Steam, superheated, experiences with, G. H. Barrus (1154), vol. 29 (1907-1908), p. 299
- Steam, superheated; facts, data and principles, R. H. Thurston (689), vol. 17 (1895-1896), p. 488
- Steam, superheated, flow of, in pipes, E. H. Foster (1150), vol. 29 (1907-1908), p. 247
- Steam, superheated, materials for control of, M. W. Kellogg (1158), vol. 29 (1907-1908), p. 355
- Steam, superheated, on locomotives, H. H. Vaughan (1156), vol. 29 (1907-1908), p. 313
- Steam, superheated, practical application of, Geo. A. Hutchinson (905), vol. 22 (1900-1901), p. 899
- Steam, superheated, pumping engine test with, E. H. Foster (853), vol. 21 (1899-1900), p. 788
- Steam, superheated, specific heat of, C. C. Thomas (1178), vol. 29 (1907-1908), p. 1021
- Steam, superheated, symposium on cast-iron fittings for, I. N. Hollis, E. F. Miller and A. S. Mann (1269), vol. 31 (1909-1910), p. 989
- Steam, superheated, tests of a compound engine using, D. S. Jacobus (1024), vol. 25 (1903-1904), p. 264
- Steam, superheated, thermal properties of, R. C. H. Heck (1198), vol. 30 (1908-1909), p. 277
- Steam, superheated, use of, and of reheaters in compound engines of large size, L. S. Marks (1030), vol. 25 (1903-1904), p. 443
- Steam, superheated, use of, in an injector, S. L. Kneass (1155), vol. 29 (1907-1908), p. 311
- Steam, tests to show influence of moisture in, on economy of steam turbine, D. S. Jacobus (729), vol. 18 (1896-1897), p. 699
- Steam, thermal properties of, G. A. Goodenough (1356), vol. 34 (1912-1913), p. 507
- Steam turbine. See turbine.
- Steam used expansively in direct-acting steam pumps, J. F. Holloway (369), vol. 11 (1889-1890), p. 235
- Steam users, estimates for, Chas. E. Emery (148), vol. 5 (1883-1884), p. 282
- Steel and cast iron, influence of titanium on properties of, A. J. Rossi (892), vol. 22 (1900-1901), p. 570
- Steel and concrete coal storage plant, F. M. Bowman (935), vol. 23 (1901-1902), p. 473
- Steel and iron, effect of alternate positive and negative stresses on, Thomas Gray (730), vol. 18 (1896-1897), p. 706
- Steel and iron, progress in manufacture of, John Fritz (701), vol. 17 (1895-1896), p. 39
- Steel and iron, anti-rust coating for, M. P. Wood (598), vol. 15 (1893-1894), p. 998; (626), vol. 16 (1894-1895), p. 350; (637), vol. 16 (1894-1895), p. 663; (713), vol. 18 (1896-1897), p. 251
- Steel and iron, yield point of, Thomas Gray (731), vol. 18 (1896-1897), p. 711
- Steel and iron, working stress of, Benj. Baker (232), vol. 8 (1886-1887), p. 157
- Steel balls, strength of, J. F. W. Harris (841), vol. 21 (1899-1900), p. 351
- Steel car axles, John Coffin (270), vol. 9 (1887-1888), p. 135
- Steel castings. See castings.
- Steel, effect of temperature on strength of wrought iron and, R. C. Carpenter (674), vol. 17 (1895-1896), p. 198
- Steel forgings. See forgings.
- Steel, heated, colors of, corresponding to different degrees of temperatures, Maunsel White and Fred W. Taylor (849), vol. 21 (1899-1900), p. 637
- Steel ingots, piping of, Thos. S. Crane (340), vol. 10 (1888-1889), p. 592

Steel, manganese, H. M. Howe (459), vol. 12 (1890-1891), p. 955

Steel, manganese, nickel and carbon, comparison of properties of before and after heat treatment, Robert R. Abbott (1476), vol. 37 (1915-1916), p. 39

Steel, notes on, Gus. C. Henning (128), vol. 4 (1882-1883), p. 410

Steel products, mechanical elimination of seams in, Robert W. Hunt (1466), vol. 36 (1914-1915), p. 933

Steel propeller blade, notes on corrosion of cast, F. B. King (595), vol. 15 (1893-1894), p. 961

Steel rails, rolling, D. K. Nicholson (365), vol. 11 (1889-1890), p. 208

Steel, rivet, steel castings, steel forgings and boiler plate, report of committee on specifications for (1026), vol. 25 (1903-1904), p. 321

Steel, rivet, steel castings, steel forgings and boiler plate, specifications for (979), vol. 24 (1902-1903), p. 921

Steel, structural, elastic curve and treatment of, Gus. C. Henning (496), vol. 13 (1891-1892), p. 572

Steel tested shortly after rolling, results obtained from, E. C. Felton (263), vol. 9 (1887-1888), p. 38

Steel, tool, factors in hardening, John A. Mathews and Howard J. Stagg, Jr. (1464), vol. 36 (1914-1915), p. 845

Steel tubes, pipes and cylinders, strength of, under internal fluid pressure, Reid T. Stewart (1352), vol. 34 (1912-1913), p. 297

Steel works, experimental, at Wyandotte, Michigan, W. F. Durfee (154), vol. 6 (1884-1885), p. 40

Sterilizer, description of new form of, A. M. Goodale (636), vol. 16 (1894-1895), p. 659

Stokers, experiments with automatic mechanical, Jay M. Whitham (690), vol. 17 (1895-1896), p. 558

Stokers for locomotives, mechanical, F. H. Colvin (932), vol. 23 (1901-1902), p. 444

Stokers, mechanical, W. R. Roney (457), vol. 12 (1890-1891), p. 921

Stoneware and porcelain, elasticity and strength of, James E. Boyd (1507), vol. 37 (1915-1916), p. 795

Straightening a leaning chimney 100 ft. high, Jos. C. Platt (611), vol. 16 (1894-1895), p. 75

Strains on an annular lid resisting internal pressure, L. H. Rutherford and F. R. Hutton (312), vol. 10 (1887-1888), p. 32

Stress, on iron, prolonged variation in effect, R. H. Thurston (109), vol. 4 (1882-1883), p. 224

Stresses in rims and rim joints of pulleys and flywheels, Gaetano Lanza (621), vol. 16 (1894-1895), p. 208

Stresses on iron and steel, effect of alternate positive and negative, Thomas Gray (730), vol. 18 (1896-1897), p. 706

Strong locomotive, distribution of steam in, F. W. Dean (304), vol. 9 (1887-1888), p. 556; (346), vol. 10 (1888-1889), p. 687

Structures, ferric, protection of, M. P. Wood (901), vol. 22 (1900-1901), p. 757

Submarine telegraph. See telegraph.

Section air chambers, comparative value of different arrangements of, on pumps, F. M. Wheeler (884), vol. 22 (1900-1901), p. 439

Suction system of a pumping engine, F. W. Dean (607), vol. 16 (1894-1895), p. 40

Sugar, influence of, upon cement, H. deB. Parsons (279), vol. 9 (1887-1888), p. 286

Sulphur dioxide and ammonia, latent heat of, D. S. Jacobus (431), vol. 12 (1890-1891), p. 307

Sulphur dioxide (SO_2), mechanical and physical properties of, De Volson Wood (419), vol. 12 (1890-1891), p. 137

Superheat and furnace relations, R. P. Bolton (1151), vol. 29 (1907-1908), p. 261

Superheated and saturated ammonia, properties of, Wm. E. Mosher (1364), vol. 34 (1912-1913), p. 739

Superheated and saturated vapors. See vapors.

Superheated steam. See steam.

Superheater and "Potter" mesh separator, F.

A. Scheffler (930), vol. 23 (1901-1902), p. 387

Superheater, Cole locomotive, W. F. M. Goss (1153), vol. 29 (1907-1908), p. 289

Superheater, performance of, A. Bement (1085), vol. 26 (1904-1905), p. 608

Superior, the, E. D. Leavitt, Jr. (30), vol. 2 (1881), p. 107

Surface condenser. See condenser.

Surges, control of, in water conduits, W. F. Durand (1353), vol. 34 (1912-1913), p. 319

Surge tank in water power plants, Raymond D. Johnson (1204), vol. 30 (1908-1909), p. 443

Surveying instrument in machine shop practice, use of, C. C. Tyler (969), vol. 24 (1902-1903), p. 360

Symbols, in technical papers, standardizing (1054), vol. 26 (1904-1905), p. 60

Symbols and cross-sections, standard, report of committee on (1468), vol. 36 (1914-1915), p. 965

T

T-square and its mountings, W. A. Gabriel (634), vol. 16 (1894-1895), p. 651

Tanks, elevated, design and construction of, W. O. Teague (1423), vol. 35 (1913-1914), p. 921

Task setting for firemen and maintaining high efficiency in boiler plants, Walter N. Polakov (1401), vol. 35 (1913-1914), p. 347

Taylor system of management, slide rules for machine shop as a part of, C. G. Barth (1010), vol. 25 (1903-1904), p. 49

Technical training, money value of, James M. Dodge (1009), vol. 25 (1903-1904), p. 40

Teeth of spur wheels, new process for generating and cutting, Ambrose Swasey (428), vol. 12 (1890-1891), p. 265

Telegraph, submarine, latest methods of, T. W. Rae (46), vol. 2 (1881), p. 357

Telegraphy, multiplex, mechanism employed in, T. W. Rae (121), vol. 4 (1882-1883), p. 321

Telescope considered historically and practically, W. R. Weaver (750), vol. 19 (1897-1898), p. 37

Telescope, turret equatorial, James Hartness (1325), vol. 33 (1911-1912), p. 499

Temperature, effect of, on strength of wrought iron and steel, R. C. Carpenter (674), vol. 17 (1895-1896), p. 198

Temperature measurements, Howard T. Barnes (1082), vol. 26 (1904-1905), p. 558

Temperatures and pressures in free expansion, A. Borsody and R. Campbell Cairncross (1059), vol. 26 (1904-1905), p. 114

Temperatures, different degrees of, colors of heated steel corresponding to, Maunsel White and Fred W. Taylor (849), vol. 21 (1899-1900), p. 627

Tension, relation between initial, and power transmitted by a belt, F. L. Emory (808), vol. 20 (1898-1899), p. 466

Terminals, American locomotives, William For-syth (12906), vol. 32 (1910-1911), p. 698

Terminals, handling locomotives at, Frederic M. Whyte (12906), vol. 32 (1910-1911), p. 661

Testing machines, recording device for, G. W. Bissell (667), vol. 17 (1895-1896), p. 76

Testing materials, appendix to report of committee on standard tests and methods of (479), vol. 13 (1891-1892), p. 275; appendix (480), vol. 13 (1891-1892), p. 289

Testing materials, report of committee on standard tests and methods of (550), vol. 14 (1892-1893), p. 1258; appendix (551), p. 1263; (654), vol. 16 (1894-1895), p. 1066

Testing materials, report of Zurich congress on standard tests and methods of (698), vol. 17 (1895-1896), p. 748

Tests and methods of testing materials, to report of committee on standard tests and methods of (698), vol. 17 (1895-1896), p. 527

- Tests and methods of testing materials, standard report of committee on (380), vol. 11 (1889-1890), p. 604
- Tests of materials, pocket recorder for, Gus. C. Henning (736), vol. 18 (1896-1897), p. 823
- Tests of metals and constructive materials, appointment of United States Government Commission of, Thomas Egleston (62), vol. 3 (1882), p. 86
- Tests, physical, of engines and machinery at World's Fair of 1893 (503), vol. 14 (1892-1893), p. 41
- Textile cost accounting, C. B. Annett and C. F. Cunningham (1408), vol. 35 (1913-1914), p. 555
- Textile industry and the mechanical engineer, H. L. Gantt (1282), vol. 32 (1910-1911), p. 499
- Textile industries of the United States, development of, Frank W. Reynolds (1339), vol. 33 (1911-1912), p. 971
- Textile manufacturing property, valuation of, Charles T. Main (759), vol. 19 (1897-1898), p. 119
- Textile-mill buildings. See mill.
- Textile mills, heating by forced circulation of hot water in, Albert G. Duncan (1496), vol. 37 (1915-1916), p. 543
- Textile mills, relative value of private and purchased electric power for, Frank W. Reynolds and Dan Adams (1497), vol. 37 (1915-1916), p. 565
- Thermal properties of steam, G. A. Goodenough (1356), vol. 34 (1912-1913), p. 507
- Thermal properties of superheated steam, R. C. H. Heck (1196), vol. 30 (1908-1909), p. 277
- Thermal quantities, graphic representation of, De Volson Wood (403), vol. 11 (1889-1890), p. 997
- Thermodynamics of certain forms of Worthington and other compound pumping engines, S. W. Robinson (64), vol. 3 (1882), p. 141
- Thermodynamics, refrigeration process and its proper place in, Geo. Richmond (514), vol. 14 (1892-1893), p. 183
- Thermodynamics without calculus, Geo. Richmond (771), vol. 19 (1897-1898), 477
- Thermo-electric pyrometer. See pyrometer.
- Thermometer, mercurial, experiments to determine rate of fall and rise of, under different conditions, A. F. Nagle (467), vol. 13 (1891-1892), p. 70
- Thread gages, pipe. See gages.
- Threads, for fixtures and fittings, report of committee on standardization of (1525), vol. 37 (1915-1916), p. 1263
- Threads, standard pipe, Geo. M. Bond (199), vol. 7 (1885-1886), p. 311
- Threads, screw, Chas. T. Porter (958), vol. 24 (1902-1903), p. 137
- Threads, screw, standard sizes of, G. R. Stetson, (9), vol. 1 (1880), p. 122
- Threads, special, for fixtures and fittings, report of the committee on standardization of (1474), vol. 37 (1915-1916), p. 25
- Threads, standard, for hose couplings (1395), vol. 35 (1913-1914), p. 301
- Throttling calorimeters. See calorimeters.
- Throttling regulation and fixed cut-off, comparison of, with automatic variable and cut-off on compound and triple-expansion engines, Chas. T. Porter (615), vol. 16 (1894-1895), p. 111
- Timber expansion of, due to absorption of water, De Volson Wood (336), vol. 10 (1888-1889), p. 539
- Timbers, factory, specifications for, F. J. Hoxie (1407), vol. 35 (1913-1914), p. 527
- Titanium, influence of, on properties of cast iron and steel, A. J. Rossi (892), vol. 22 (1900-1901), p. 570
- Tools, diamond, Gus. C. Henning (1073), vol. 26 (1904-1905), p. 409
- Tools, high-speed, and machines to fit them, H. I. Brackenbury (1291a), vol. 32 (1910-1911), p. 727
- Tools, high-speed, topical discussion on (1291b), vol. 32 (1910-1911), p. 753
- Tools, special, intrinsic value of, Oberlin Smith (238), vol. 8 (1886-1887), p. 258
- Topical discussion and notes of experience, What Does it Cost to Run Trains at High Speed? pp. 269-277; Some Peculiarities of Springs, pp. 277-290; New Decimal System of Measurements, pp. 291-297; (924), vol. 23 (1901-1902), p. 269
- Topical discussions and notes of experience, Smoke Consumption, pp. 315-325; The Elastic Limit of a Substance, pp. 325-330; Experience with Oil Burners, pp. 330-340; Separating Oil from Exhaust Steam, pp. 341-348; Tempering and Annealing Steel, pp. 349-359; (968), vol. 24 (1902-1903), p. 315
- Torsion balance, William Kent (181), vol. 6 (1884-1885), p. 636
- Traction engines. See engines.
- Tractor, farm, economic importance of, L. W. Ellis (1309), vol. 33 (1911-1912), p. 109
- Train resistance, rational formula for, John Balch Blood (982), vol. 24 (1902-1903), p. 945
- Training, college and apprentice, J. P. Jackson (1160), vol. 29 (1907-1908), p. 473
- Training for city employees in the municipal colleges of Germany, Clyde L. King (1455), vol. 36 (1914-1915), p. 631
- Training, technical, at Worcester Free Institute, G. I. Alden (177), vol. 6 (1884-1885), p. 510
- Training workmen, H. L. Gantt (1221), vol. 30 (1908-1909), p. 1037
- Transmission and generation, water power, Samuel Webber (665), vol. 17 (1895-1896), p. 41
- Transmission machinery, of central stations, power losses in, W. S. Aldrich (585), vol. 15 (1893-1894), p. 705
- Transmission of power and auxiliary engines on naval vessels, G. W. Dickie (762), vol. 19 (1897-1898), p. 233
- Trials of warm blast apparatus for transferring part of the heat of escaping flue gases to the

- furnace, J. C. Hoadley (183), vol. 6 (1884-1885), p. 676
- Trucks, four-wheel, for passenger cars, Roy V. Wright (1503), vol. 37 (1915-1916), p. 689
- Tube, seamless, method of manufacture and tests of, R. C. Carpenter and P. J. Fickinger (783), vol. 19 (1897-1898), p. 754
- Tubes, collapsing pressures of Bessemer steel lap-welded, R. T. Stewart (1116), vol. 27 (1905-1906), p. 730
- Tubes, lap welded steel tubes, collapsing pressures of, R. T. Stewart (1143), vol. 29 (1907-1908), p. 123
- Tubes, new method of making, from solid bars, Geo. H. Babcock (252), vol. 8 (1886-1887), p. 564
- Tubes, stresses in, Reid T. Stewart (1315), vol. 33 (1911-1912), p. 305
- Tubing, aluminum-bronze seamless, Leonard Waldo (719), vol. 18 (1896-1897), p. 437
- Tubing, flexible, novel form of, T. R. Almond (423), vol. 12 (1890-1891), p. 197
- Turbine, 30,000-kw. cross-compound steam, report upon efficiency tests of, H. G. Stott and W. S. Finlay, Jr. (1551), vol. 38 (1916-1917), p. 655
- Turbine, analysis of Tremont, De Volson Wood (638), vol. 16 (1894-1895), p. 707
- Turbine, DeLaval steam, E. S. Lea and E. Meden (1047), vol. 25 (1903-1904), p. 1056
- Turbine design as modified for close regulation, Geo. A. Buvinger (1113), vol. 27 (1905-1906), p. 698
- Turbine, flow, water recorder, C. M. Allen (985), vol. 24 (1902-1903), p. 983
- Turbine pump design. See pump.
- Turbine, steam, J. B. Webb (345), vol. 10 (1888-1889), p. 680
- Turbine, steam-engine, test of a 15,000-kw., H. G. Stott and R. J. S. Pigott (1275), vol. 32 (1910-1911), p. 69
- Turbine, steam, from an operating standpoint, F. A. Waldron (987), vol. 24 (1902-1903), p. 999
- Turbine, steam, in modern engineering, W. L. R. Emmet (1046), vol. 25 (1903-1904), p. 1041
- Turbine, steam, quick starting of, compared with reciprocating engine, A. S. Mann (1080), vol. 26 (1904-1905), p. 524
- Turbine, steam, some theoretical and practical considerations in, F. Hodgkinson (1037), vol. 25 (1903-1904), p. 716
- Turbine, steam; the steam engine of maximum simplicity and of highest thermal efficiency, R. H. Thurston (876), vol. 22 (1900-1901), p. 170
- Turbine, steam, test of a 10,000-kw., Sam L. Naphtaly (1299a), vol. 32 (1910-1911), p. 1251
- Turbine, steam, tests to show influence of moisture in steam on economy of, D. S. Jacobus (729), vol. 18 (1896-1897), p. 699
- Turbine, tests of ten horse-power DeLaval steam, W. F. M. Goss (668), vol. 17 (1895-1896), p. 81
- Turbine turbo-compressor, commercial application of, Richard H. Rice (1320), vol. 33 (1911-1912), p. 381
- Turbine water wheels, efficiency tests of, Wm. O. Webber (1107), vol. 27 (1905-1906), p. 590
- Turbines, compound steam, energy and pressure drop in, Forrest E. Cardullo (1317), vol. 33 (1911-1912), p. 325
- Turbines, efficiency of, Samuel Webber (61), vol. 3 (1882), p. 84
- Turbines, small steam, G. A. Orrok (1242), vol. 31 (1909-1910), p. 263
- Turbines, steam, condensers for, George I. Rockwood (1072), vol. 26 (1904-1905), p. 383
- Turbines, steam, development of, A. G. Christie (1355), vol. 34 (1912-1913), p. 435
- Turbines, steam, different applications of, A. Rateau (1038), vol. 25 (1903-1904), p. 782
- Turbines vs engines in units of small capacities, J. S. Barstow (1505), vol. 37 (1915-1916), p. 751
- Turbo-compressor, turbine, commercial application of, Richard H. Rice (1320), vol. 33 (1911-1912), p. 381
- Turbo-generator set, test of a 9000-kw., F. H. Varney (1299b), vol. 32 (1910-1911), p. 1267
- Turbo-generators, fire hazard in, G. S. Lawler (1420), vol. 35 (1913-1914), p. 875
- Turret lathe. See lathe.
- Twist drills. See drills.

U

- Utilization and generation of steam by the Lykens Valley Coal Company, R. V. Norris (794), vol. 20 1898-1899, p. 50
- Utilization of waste heat for steam-generating purposes, Arthur D. Pratt (1550), vol. 38 (1916-1917), p. 599

V

- Vacuum cleaning systems, tests of, J. R. McColl (1412), vol. 35 (1913-1914), p. 705
- Vacuum evaporators, tests upon transmission of heat in, E. W. Kerr (1413), vol. 35 (1913-1914), p. 731
- Valuation, industrial and public utility, John H. Gray (1575), vol. 38 (1916-1917), p. 1247
- Valuation of industrial properties versus valuation of industrial methods, Walter N. Polakov (1577), vol. 38 (1916-1917), p. 1297
- Valuation of textile manufacturing property, Charles T. Main (759), vol. 19 (1897-1898), p. 119
- Valuing property, principles of, Henry K. Rowell (1379), vol. 34 (1912-1913), p. 1231
- Valve, Baltimore sewerage pump, A. F. Nagle

- (1366), vol. 34 (1912-1913), p. 819
- Valve, description of improved centrifugal governor and, Chas. T. Porter (617), vol. 16 (1894-1895), p. 134
- Valve dynamometer. See dynamometer.
- Valve for locomotives, Allen, C. H. Quereau (809), vol. 20 (1898-1899), p. 475
- Valve gear, Buckeye engine, A. K. Mansfield (567), vol. 15 (1893-1894), p. 177
- Valve gear for gas, steam and air engines, E. W. Naylor (920), vol. 23 (1901-1902), p. 151
- Valve gear of the Willans engine, John Svenson (798), vol. 20 (1898-1899), p. 42
- Valve gear, steam actuated, W. H. Collier (1092), vol. 26 (1904-1905), p. 891
- Valve, locomotive slide, friction tests of, Frank C. Wagner (833), vol. 21 (1899-1900), p. 242
- Valve motion, Carl Angstrom (131), vol. 5 (1883-1884), p. 41
- Valve motion of duplex air compressors, improvement in, S. H. Bunnell (1017), vol. 25 (1903-1904), p. 138
- Valve, pulley-press, F. H. Stillman (889), vol. 22 (1900-1901), p. 535
- Valve, rotary piston, compounding centrifugal and load governing by, W. A. Aldrich (482), vol. 13 (1891-1892), p. 325
- Valve, safety, capacity, P. G. Darling (1232), vol. 31 (1909-1910), p. 109
- Valve, safety, discussion (1233), vol. 31 (1909-1910), p. 129
- Valve, self-packing, H. F. J. Porter (53), vol. 2 (1881), p. 512
- Valve stems and piston rods, packing for, L. F. Lyne (16), vol. 1 (1880), p. 241
- Valves, automatic sprinkler, system for control of, Fred J. Miller (1422), vol. 35 (1913-1914), p. 901
- Valves, back pressure, S. W. Robinson (97), vol. 4 (1882-1883), p. 150
- Valves, balanced, C. C. Collins (116), vol. 4 (1882-1883), p. 268
- Valves, cut-off, motion curves of, A. W. Robinson (130), vol. 5 (1883-1884), p. 34
- Valves for steam engines, air engines and compressors, F. W. Gordon (824), vol. 20 (1898-1899), p. 967
- Valves, marine safety, analysis of, with suggestions for repairs and improvements, E. F. Maas (1567), vol. 38 (1916-1917), p. 1105
- Valves of high-speed steam engines, description of cam for actuating, Chas. T. Porter (616), vol. 16 (1894-1895), p. 117
- Valves, poppet, pressure drop through, Chas. E. Lucke (1099), vol. 27 (1905-1906), p. 232
- Valves, pump, and valve areas, A. F. Nagle (1267), vol. 31 (1909-1910), p. 953
- Valves, pump, Cornish or double-beat, A. F. Nagle (335), vol. 10 (1888-1889), p. 521
- Valves, safety, for locomotives, F. M. Whyte (1231), vol. 31 (1909-1910), p. 105
- Valves, safety, results of tests on the discharge capacity of, E. F. Miller (1358), vol. 34 (1912-1913), p. 819
- Valves, steam, safety, George H. Clark (1546), vol. 38 (1916-1917), p. 519
- 1913), p. 571
- Vapor and vapor engines, some properties of, De Volson Wood (343), vol. 10 (1888-1889), p. 648
- Vapor engines. See engines.
- Vapors, saturated and superheated, formulas for, de Volson Wood (344), vol. 10 (1888-1889), p. 670
- Veneer cutters, steam, direct-acting, Thos. S. Crane (245), vol. 8 (1886-1887), p. 426
- Ventilating and heating an office and warehouse building, economical method of, Henry I. Snell (267), vol. 9 (1887-1888), p. 99
- Ventilating flues, determination of heating surface required in, W. P. Trowbridge (60), vol. 3 (1882), p. 72
- Ventilation by chimneys, and ventilation by fans, relative economy of, W. P. Trowbridge (212), vol. 7 (1885-1886), p. 531
- Ventilation of Boston subway, H. A. Carson (1135), vol. 28 (1906-1907), p. 927
- Venturi meter for boiler feed, tests on, C. M. Allen (1254), vol. 31 (1909-1910), p. 589
- Venturi tube, flow of fluids in, E. P. Coleman (1124), vol. 28 (1906-1907), p. 483
- Vertical engines, balanced. See engines.
- Viaduct, Kinzua, T. C. Clarke (400), vol. 11 (1889-1890), p. 961
- Vibration in textile-mill buildings, G. H. Perkins (1558), vol. 38 (1916-1917), p. 879
- Viscosimeter, new form of, and the measurement of viscosity, H. C. Hayes and G. W. Lewis (1540), vol. 38 (1916-1917), p. 383
- Viscosity, coefficient of, and ratio of specific heats of natural gas from typical fields, Robert F. Earhart (1562), vol. 38 (1916-1917), p. 979
- Viscosity determinations of lubricants, mechanical significance of, J. E. Denton (285), vol. 9 (1887-1888), p. 369
- Viscosity, measurement of, and a new form of viscosimeter, H. C. Hayes and G. W. Lewis (1540), vol. 38 (1916-1917), p. 383
- Votometer, Bardwell, A. F. Bardwell and James Hamilton (911), vol. 22 (1900-1901), p. 1083

W

- Wages, rational basis for, H. Emerson (1040), vol. 25 (1903-1904), p. 868
- Water and heat consumption of a compound engine at various powers, D. S. Jacobus (999), vol. 24 (1902-1903), p. 1274
- Water and steam, expansion of, without transfer of heat, A. Faber Du Faur (70), vol. 3 (1882), p. 223
- Water consumption of unjacketed 1600 horse power compound Harris-Corliss engine, J. E. Denton, D. S. Jacobus and R. H. Rice (591), vol. 15 (1893-1894), p. 882
- Water, density of, at different temperatures, A. F. Nagle (488), vol. 13 (1891-1892), p. 396
- Water gas. See gas.

- Water, comparative test of hot, and steam heating plant, R. C. Carpenter (395), vol. 11 (1889-1890), p. 918
- Water hammer, in steam pipes, R. H. Thurston (127), vol. 4 (1882-1883), p. 404
- Water hammer, some experiments on effect of, R. C. Carpenter and S. H. Barraclough (576), vol. 15 (1893-1894), p. 510
- Water measurements. See measurements.
- Water meter. See meter.
- Water power, analysis of commercial value of, per horsepower per annum, A. F. Nagle (967), vol. 24 (1902-1903), p. 286
- Water power and steam, cost of, Chas. T. Main (360), vol. 11 (1889-1890), p. 108
- Water power: Caratunk Falls, Kennebec River, Maine, Samuel McElroy (666), vol. 17 (1895-1896), p. 58
- Water power, development of Hannawa Falls, W. C. Johnson (919), vol. 23 (1901-1902), p. 131
- Water power: its generation and transmission, Samuel Webber (665), vol. 17 (1895-1896), p. 41
- Water power, notes on problem in, John Richardson (483), vol. 13 (1891-1892), p. 331
- Water power, value of, Chas. T. Main (471), vol. 13 (1891-1892), p. 140
- Water power, damages for loss of, F. W. Dean (1463), vol. 36 (1914-1915), p. 835
- Water-power plants, speed regulation of, John Sturgess (1112), vol. 27 (1905-1906), p. 682
- Water powers, computation of values of, and the damages caused by the diversion of water used for power, Chas. T. Main (1057), vol. 26 (1904-1905), p. 68
- Water, purification of, for domestic and manufacturing purposes, T. S. Crane (216), vol. 7 (1885-1886), p. 617
- Water-purifying plant, Howard Stillman (768), vol. 19 (1897-1898), p. 415
- Water-softening plant at Lorraine Steel Company's Blast Furnace, N. O. Goldsmith (857), vol. 21 (1899-1900), p. 874
- Water-wheel governor. See governor.
- Waterwheels, high-pressure, regulation of, for power transmission plants, Geo. J. Henry, Jr. (1111), vol. 27 (1905-1906), p. 662
- Waterwheels, turbine, systematic testing of, in the United States, R. H. Thurston (243), vol. 8 (1886-1887), p. 359
- Water wheels, testing of, after installation, C. M. Allen (1277), vol. 32 (1910-1911), p. 275
- Weights and measures, H. R. Towne (1134), vol. 28 (1906-1907), p. 845
- Weights and measures, rational solution of problem of, Sidney A. Reeve (962), vol. 24 (1902-1903), p. 184
- Weir, calibration of, and tests of centrifugal pumps at Bridgeport Pumping Station, Chicago, Ill., R. C. Carpenter (763), vol. 19 (1897-1898), p. 255
- Weir, new form of canal waste, John R. Freeman (583), vol. 15 (1893-1894), p. 669
- Weir, V-notch, method of measurement, D. Robert Yarnall (1374), vol. 34 (1912-1913), p. 1055
- Welding, electric, C. J. H. Woodbury (315), vol. 10 (1888-1889), p. 95
- Welding for boiler joints, pencil electrode method, E. A. Wildt (1569), vol. 38 (1916-1917), p. 1141
- Wheel rims, strength of, A. K. Mansfield (796), vol. 20 (1898-1899), p. 125
- Wheels, flyband, strains in rims of, produced by centrifugal force, J. B. Stanwood (515), vol. 14 (1892-1893), p. 251
- Winding and pumping machinery in anthracite coal regions of Pennsylvania, Howell Green (108), vol. 4 (1882-1883), p. 217
- Windmill as a prime mover, economy of, A. R. Wolff (76), vol. 3 (1882), p. 319
- Wire rope fastenings, Wm. Hewitt (306), vol. 9 (1887-1888), p. 761
- Wire-testing machine, convenient form of, Arthur L. Rice (751), vol. 19 (1897-1898), p. 71
- Workmen, skilled, plan to provide a supply of, M. W. Alexander (1123), vol. 28 (1906-1907), p. 439
- Workmen's compensation, and accident prevention, attitude of employer toward, W. H. Cameron (1512), vol. 37 (1915-1916), p. 899
- Worm gearing. See gearing.
- Wrought iron chain cable, heat treatment of, W. W. Webster, E. L. Patch and F. G. Coburn (1571), vol. 38 (1916-1917), p. 1159

**DIRECTORY SECTION
PART I**

**Mechanical Equipment
Directory**

621

IN this, its third issue as a reference feature of the volume of Condensed Catalogues, the general Mechanical Equipment Directory shows a further gain in scope and comprehensiveness.

Wherever the omission of appropriate subject headings has been noted in this office, or called to the attention of the Society by members or others, these have been added. At the same time every effort has been made to secure and include the names of the greatest possible number of eligible manufacturers, with the result that in this volume the Directory contains the names and addresses of more than 3700 firms, listed under upward of 2700 classifications of equipment.

Owing to the considerable extra cost of compiling and publishing the Directory, it was found necessary, as in the previous issues, to limit the free listings for non-space users to three subject headings for each firm, additional listings being procurable at the rate of three dollars each. Firms using space for publication of their data in the Catalogue Section of the volume are entitled to full listing of their products in the Directory without additional charge, with the firm name printed in capital type and followed by the page numbers of their catalogue data.

The Mechanical Equipment Directory is especially designed to meet the ready-reference needs of mechanical engineers and others requiring a highly specialized list of this description. It is believed that the Directory will prove invaluable for this purpose, and also as a guide to and background for the more detailed information presented in the Catalogue Section of the volume.

NOTE: Trade names are given in parenthesis after the firm name under each classification.

MECHANICAL EQUIPMENT DIRECTORY

A

ABRASIVE MATERIALS

Abrasive Co., Bridesburg, Philadelphia, Pa.
CARBORUNDUM CO., Niagara Falls, N. Y... *p. 389*

Dessau, S. Maurice, 6 Maiden Lane, New York
General Abrasive Co., Niagara Falls, N. Y.
Hampden Corundum Wheel Co., Springfield, Mass.

MAXF GRINDING WHEEL CORP'N, Chester, Mass... *p. 390*

NORTON CO., Worcester, Mass... *p. 391*
STERLING GRINDING WHEEL CO., Tiffin, O... *p. 392*

ABRASIVE WHEELS

(See Grinding Wheels)

ACCUMULATORS, HYDRAULIC

ALDRICH PUMP CO., Allentown, Pa... *p. 438*

ALLIANCE MACHINE CO., Alliance, O... *p. 264*

BUCKEYE IRON & BRASS WORKS, Dayton, O... *p. 481*

BURROUGHS CO., CHARLES, Newark, N. J... *p. 454*

Elmes Engineering Works, Chas. F., 215 N. Morgan St., Chicago, Ill.

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis... *p. 455*

Hydraulic Press Mfg. Co., Mount Gilead, Ohio.
Metalwood Mfg. Co., Leib & Wight Sts., Detroit, Mich.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Perrin & Co., Wm. R., 37 W. Van Buren St., Chicago, Ill.

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p. 456*

WATSON-STILMAN CO., 35 Church St., New York... *p. 457*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

ACETYLENE APPARATUS

Carbic Mfg. Co., Duluth, Minn.

C-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York... *p. 419*

Modern Engineering Co., 23rd & Walnut Sts., St. Louis, Mo.

OXWELD ACETYLENE CO., 646-686 Frel-inghuysen Ave., Newark, N. J... *p. 421*

ACETYLENE GAS

Air Reduction Sales Co., 120 Broadway, New York.

C-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York... *p. 419*

ACETYLENE LIGHTS (Portable)

ALBURN CO., ALEXANDER, Baltimore, Md... *p. 420*

AERIAL TRAMWAYS

See Tramways, Wire Rope)

AGITATORS

DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York... *p. 28*

HILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*

Jorr Co., 1009 17th St., Denver, Colo.

HILL CLUTCH CO., Cleveland, O... *p. 208*

MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis... *p. 112*

HOENIX IRON WORKS CO., Meadville, Pa... *p. 407*

—Steam Jacketed

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... *p. 194*

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 494*

PFAUDLER CO., Rochester, N. Y... *p. 490*

Sowers Mfg. Co., 1300 Niagara St., Buffalo, N. Y.

AGRICULTURAL MACHINERY

Ann Arbor Machine Co., Ann Arbor, Mich.

Associated Manufacturers Co., Waterloo, Ia.

Case Threshing Machine Co., J. I., Racine, Wis.

Castle Engineering Co., Inc., A. M., La Crosse, Wis.

Fairmont Gas Engine & Railway Motor Car Co., North Main St., Fairmont, Minn.

Gale Mfg. Co., Albion, Mich.

Holt Mfg. Co., Peoria, Ill.

International Harvester Co. of America, Harvester Bldg., Chicago, Ill.

Russell & Co., Massillon, O.

AIR BRAKES, COMPRESSORS, SEPARATORS, ETC.

(See Brakes, Compressors, Separators, Etc., Air)

AIR CONDITIONING APPARATUS

AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*

Bahnon Humidifier Co., Winston-Salem, N. C.

BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... *p. 470*

Carrier Air Conditioning Co., Buffalo, N. Y.

CARRIER ENGINEERING CORP'N, Cortlandt St., New York... *p. 471*

Cramer, Stuart W., Charlotte, N. C.

Dicks, Slosson Co., Inc., 302 Broadway, New York.

Drying Systems, Inc., 322 N. Michigan Ave., Chicago, Ill.

Gordon Engineering Corp'n, 39 Cortlandt St., New York.

Kauffman Engineering Co., 3951 53 Laclede Ave., St. Louis, Mo.

Massachusetts Blower Co., Howard St., Watertown, Mass.

New York Blower Co., 370 Central Ave., E. Orange, N. J.

STERLING BLOWER CO., Hartford, Conn... *p. 436*

AIR LIFT PUMPING SYSTEMS

Indiana Air Pump Co., 812 K. of P. Bldg., Indianapolis, Ind.

INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*

SULLIVAN MACHINERY CO., 121 S. Michigan Ave., Chicago, Ill... *p. 430*

Tilghman-Brooksbank Sand Blast Co., 1126 S. Eleventh St., Philadelphia, Pa.

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York... *pp. 30, 117, 431, 447*

AIR TANKS AND CYLINDERS

(See Receivers, Air)

AIR WASHERS

AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*

American Spray Co., 26 Cortlandt St., New York

BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... *p. 470*

CARRIER ENGINEERING CORP'N, 39 Cortlandt St., New York... *p. 471*

Abr

See Catalogue Section for data of firms listed in capital type

AIR WASHERS (Continued)

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . . *p. 404*
 *SPRAY ENGINEERING CO., 93 Federal St., Boston, Mass. . . . *p. 113*
 STURTEVANT CO., B. F., Hyde Park, Boston, Mass. . . . *pp. 74, 75*

ALARM WATER COLUMNS
(See Water Columns, Alarm)**ALLOYS**

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. . . . *p. 294*
 AMERICAN BRASS CO., Waterbury, Conn. . . . *p. 295*
 American Vanadium Co., 316 Frick Bldg., Pittsburgh, Pa.
 Bario Metal Corp'n, 167 W. 18th St., New York
 Driver-Harris Co., Harrison, N. J.
 Magnolia Metal Co., 113-115 Bank St., New York
 Metal & Thermit Corp'n, 120 Broadway, New York
 Standard Alloys Co., Forbes & Meyran Ave., Pittsburgh, Pa.
 Tungsten Products Co. of Maryland, Baltimore, Md.
 Vanadium Alloys Steel Co. (Vasco), Latrobe, Pa.

— **Non-ferrous**

LUMEN BEARING CO., Buffalo, N. Y. . . . *p. 290*

— **Uranium**

Standard Alloys Co., Forbes & Meyran Aves., Pittsburgh, Pa.

— **Vanadium**

Standard Alloys Co., Forbes & Meyran Aves., Pittsburgh, Pa.

— **White Metal**

Riverside Metal Refining Co., Connellsville, Pa.

Seymour Mfg. Co., Seymour, Conn.

Air**ALTERNATORS**

(See Generators, Electric)

ALUMINUM (Ingot, Sheet)

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. . . . *p. 294*
 UNITED LEAD CO., 111 Broadway, New York. . . . *p. 299*

AMMETERS

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa. . . . *p. 539*
 BRISTOL CO., Waterbury, Conn. . . . *p. 530*
 BROWN INSTRUMENT CO., Philadelphia, Pa. . . . *p. 531*
 *GENERAL ELECTRIC CO., Schenectady, N. Y. . . . *pp. 20, 21, 521*
 Jewell Electrical Instrument Co., 1650 Walnut St., Chicago, Ill.
 Pignolet, Louis M., 78 Cortlandt St., New York
 REPUBLIC FLOW METERS CO., 565 W. Washington Blvd., Chicago, Ill. . . . *p. 522*
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . . *pp. 114, 115*
 *WESTON ELECTRICAL INSTRUMENT CO., 49 Weston Ave., Waverly Park, Newark, N. J. . . . *p. 537*

AMMONIA

Barrett Co., 17 Battery Place, New York.
 *DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York. . . . *p. 28*
 Herf & Frerichs Chemical Co., 929 Pierce Bldg., St. Louis, Mo.
 National Ammonia Co., St. Louis, Mo.

AMMONIA CONDENSERS, FITTINGS, ETC.

(See Condensers, Fittings, etc., Ammonia)

AMMONIA SAFETY SYSTEMS

Henneböhle Co., F., 51st St. & S. Chicago Ave., S. Chicago, Ill.

ANCHORS, EXPANSION

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y. . . . *p. 140*

DIAMOND EXPANSION BOLT CO., 90 West St., Cor. Cedar, New York. . . . *p. 409*
 Steward & Romaine Mfg. Co., 124 N. 6th St., Philadelphia, Pa.

ANEMOMETERS

Davis Instrument Mfg. Co., Inc., 110 W. Fayette St., Baltimore, Md.
 Queen-Gray Co., 616-620 Chestnut St., Philadelphia, Pa.
 TAYLOR INSTRUMENT COS., Rochester, N. Y. . . . *p. 536*

ANNEALING

*AMERICAN METAL TREATMENT CO., Elizabeth, N. J. . . . *p. 418*
 Bidle Co., W. S., 1411 E. 45th St., Cleveland, Ohio
 KENWORTHY, INC., CHARLES F. Waterbury, Conn. . . . *pp. 414, 415*
 ROCKWELL CO., W. S., 50 Church St., New York. . . . *p. 413*

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y. . . . *p. 397*
 WORCESTER PRESSED STEEL CO., Worcester, Mass. . . . *p. 305*

ANTI-FRICTION METALS

(See Metals, Anti-Friction)

ANVILS

ATKINS & CO., INC., E. C., Indianapolis, Ind. . . . *p. 385*
 Hay-Budden Mfg. Co., 254 N. Henry St., Brooklyn, N. Y.

ARBOR PRESSES

(See Presses, Arbor)

ARBORS

CLEVELAND TWIST DRILL CO., Cleveland, O. . . . *p. 378*
 Nielson-Barton Chuck Co., 106 S. Jefferson St., Chicago, Ill.

ARCH PROTECTORS, BOILER

Lamprey Co., 285 Elm St., Westfield, Mass.

ARCHES

*CASEY-HEDGES CO., Chattanooga, Tenn. . . . *pp. 42, 43*
 *DETRICK CO., M. H., 549 W. Washington St., Chicago, Ill. . . . *p. 97*
 *GREEN ENGINEERING CO., 13 Kennedy Ave., East Chicago, Ind. . . . *pp. 80, 81*
 WASHBURN & GRANGER, 50 Church St., New York. . . . *p. 91*

— **Boiler**

Monarch Boiler Arch Co., 620-630 Wells Bldg., Milwaukee, Wis.

— **Fire Door**

BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa. . . . *p. 86*

*CASEY-HEDGES CO., Chattanooga, Tenn. . . . *pp. 42, 43*

*DETRICK CO., M. H., 549 W. Washington St., Chicago, Ill. . . . *p. 97*
 McLeod & Henry Co., Troy, N. Y.
 Monarch Boiler Arch Co., 620-630 Wells Bldg., Milwaukee, Wis.

WASHBURN & GRANGER, 50 Church St., New York. . . . *p. 91*

— **Ignition (Flat, Suspended)**

*CASEY-HEDGES CO., Chattanooga, Tenn. . . . *pp. 42, 43*

CHICAGO TILE ARCH FURNACE CO., 1160 Monadnock Block, Chicago, Ill. . . . *p. 8*

*DETRICK CO., M. H., 549 W. Washington St., Chicago, Ill. . . . *p. 97*

*EDGE MOOR IRON CO., Edge Moor, Del. . . . *p. 46*

Factory Engineering Co., 760 Hippodrome Prospect Ave., Cleveland, O.

*GREEN ENGINEERING CO., (See flex), 13 Kennedy Ave., East Chicago, Ind. . . . *pp. 80, 81*

WASHBURN & GRANGER, 50 Church St., New York. . . . *p. 91*

—Rear-Combustion Chamber

*CASEY-HEDGES CO., Chattanooga, Tenn.
..p. 42, 43

*DETRICK CO., M. H., 549 W. Washington
St., Chicago, Ill...p. 97

Factory Engineering Co., 760 Hippodrome,
Prospect Ave., Cleveland, O.

*GREEN ENGINEERING CO., 13 Kennedy
Ave., East Chicago, Ind...pp. 80, 81

McLeod & Henry Co., Troy, N. Y.

Monarch Boiler Arch Co., 629-930 Wells Bldg.,
Milwaukee, Wis.

WASHBURN & GRANGER, 50 Church St.,
New York...p. 91

—Sectional (Locomotive)

American Arch Co., McCormick Bldg., Chicago,
Ill.

—Water (For Boilers)

Lamprey Co., 285 Elm St., Westfield, Mass.

ASBESTOS PRODUCTS

Acme Asbestos Covering & Supply Co., 407
N. Ada St., Chicago, Ill.

Anchor Packing Co., 7th & Filbert Sts., Phila-
delphia, Pa.

Asbestos & Rubber Works of America, 1784
Broadway, New York.

Aycock, Co., R. V., 1702 Grand Ave., Kansas
City, Mo.

Burgman Asbestos & Packing Mills, Feodor,
26 Cortlandt St., New York.

CAREY CO., PHILIP, Cincinnati, O...pp.
164, 165

Central Asbestos & Magnesia Co., 214-216
W. Grand Ave., Chicago, Ill.

Dominion Asbestos & Rubber Corp'n, 154 Nassau
St., New York.

Fibre Cell Asbestos Mfg. Co., 407-409 S. Clinton
St., Chicago, Ill.

FRANKLIN MFG. CO., Franklin, Pa...
pp. 164, 165

General Asbestos & Rubber Co., Charleston,
S. C.

GREENE, TWEED & CO., 109 Duane St.,
New York...p. 168

*JOHNS-MANVILLE CO., H. W., 296 Madi-
son Ave., New York...p. 162

KEASBEY & MATTISON CO., Ambler, Pa.
...pp. 164, 165

Keasbey Co., Robert A., 445 West St., New
York.

*MAGNESIA ASSOCIATION OF AMERICA,
721 Bulletin Bldg., Philadelphia, Pa...pp.
164, 165

National Air Cell Covering Co., 163-93 Hen-
derson St., Jersey City, N. J.

Nightingale & Childs Co., 205 Congress St.,
Boston, Mass.

Norristown Magnesia & Asbestos Co., Norris-
town, Pa.

Richards Mfg. Co., 325 Scribner Ave., Grand
Rapids, Mich.

Sall Mountain Co., 230 S. La Salle St., Chicago,
Ill.

Thermoid Rubber Co., Trenton, N. J.

ASH HANDLING SYSTEMS (Steam Jet)

AMERICAN STEAM CONVEYOR CORP'N,
326 W. Madison St., Chicago, Ill...p. 101

Brady Foundry Co., James A., 45th St. &
Western Blvd., Chicago, Ill.

*GREEN ENGINEERING CO., 13 Kennedy
Ave., East Chicago, Ind...pp. 80, 81

Hagan Corp'n, 401 Peoples Bank Bldg., Pitts-
burgh, Pa.

Parson Mfg. Co., 35 Nassau St., New York.

ASH LIFTS, TELESCOPIC

BARTLETT & SNOW CO., C. O., Cleveland,
O...p. 249

Gillis & Geoghegan, 537 W. Broadway, New
York.

ASPHALT

Warner-Quinlan Asphalt Co., 79 Wall St.,
New York.

ASSAY APPARATUS

Braun Corp'n, Los Angeles, Cal.

Buffalo Dental Mfg. Co., 587-589 Main St.,
Buffalo, N. Y.

Sturtevant Mill Co., Harrison Sq., Boston,
Mass.

AUGER MACHINES

CHAMBERS BROS. CO., Philadelphia, Pa.
...p. 480

AUTOMOBILE BODY MACHINERY

BLISS CO., E. W., 19 Adams St., Brooklyn,
N. Y...pp. 310, 311

Pettingell Machine Co., Amesbury, Mass.

Quickwork Co., St. Marys, O.

TOLEDO MACHINE & TOOL CO., Toledo,
O...p. 313

Yoder Co., 1024 B. of L. E. Bldg., Cleveland,
O.

AUTOMOBILE FENDER MACHINERY

Quickwork Co., St. Marys, O.

AUTOMOBILE PARTS

BAHSON-DOW MFG. CO., 60 Fulda St.,
Roxbury, Boston, Mass...p. 399

Chicago Screw Co., 1026 S. Homan Ave.,
Chicago, Ill.

CINCINNATI SCREW CO., Twightwee, O.
(Cincinnati Suburb)...p. 402

Ever-Tight Piston Ring Co., 1600 Kingsland
Ave., St. Louis, Mo.

Gear Grinding Machine Co., Detroit, Mich.

Micro Piston Ring Co., 110-116 Nassau St.,
New York.

Sabin Machine Co., Cleveland, O.

Spacke Machine & Tool Co., Indianapolis,
Ind.

Torbensen Axle Co., 115 E. 153rd St., Cleve-
land, O.

WILLIAMS & CO., J. H., 70 Richards St.,
Brooklyn, N. Y...p. 397

—Pressed Steel

AMERICAN PULLEY CO., 4200 Wissahickon
Ave., Philadelphia, Pa...p. 200

BOSSERT CORP'N, Utica, N. Y...p. 304

Geuder, Paeschke & Frey Co., 1351 St. Paul
Ave., Milwaukee, Wis.

GLASGOW IRON CO., 15th & Market Sts.,
Philadelphia, Pa...p. 68

Grant-Lees Gear Co., 2367 E. 69th St., Cleve-
land, O.

Spicer Mfg. Corp'n, South Plainfield, N. J.

UNION DROP FORGE CO., 358 W. Grand
Ave., Chicago, Ill...p. 302

WORCESTER PRESSED STEEL CO., Wor-
cester, Mass...p. 305

Worcester Stamped Metal Co., 9 Hunt St.,
Worcester, Mass.

AUTOMOBILE PARTS MACHINERY

BLISS CO., E. W., 19 Adams St., Brooklyn,
N. Y...pp. 310, 311

TOLEDO MACHINE & TOOL CO., Toledo,
O...p. 313

AXLES

Cross Gear & Engine Co., 800-806 Bellevue
Ave., Detroit, Mich.

Johnson & Co., Inc., J. R., P. O. Box 515,
Richmond, Va.

Liggett Spring & Axle Co., Monongahela, Pa.

UNION DROP FORGE CO., 358 W. Grand
Ave., Chicago, Ill...p. 302

—Automobile and Truck

Bayard & Co., M. L., Woodbine, N. J.

Clark Equipment Co., 1415 Railway Exchange,
Buchanan, Mich.

Empire Axle Co., Dunkirk, N. Y.

Hess Spring & Axle Co., 146 W. 66th St.,
Carthage, Cincinnati, O.

Industrial Equipment Co., 70th & Garfield Ave.,
Oakland, Cal.

Jacobson Machine Mfg. Co., Warren, Pa.

Sabin Machine Co., Cleveland, O.

Sheldon Axle & Spring Co., Wilkes-Barre, Pa.

Spacke Machine & Toole Co., Indianapolis,
Ind.

Torbensen Axle Co., 1115 E. 152nd St., Cleve-
land, O.

See Catalogue Section for data of firms listed in capital type

AXLES (Continued)**—Automobile and Truck**VOGT MACHINE CO., HENRY, Louisville, Ky...*p. 63*WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...*p. 397***—Car and Locomotive**BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind...*p. 35**FULLER-LEHIGH CO., Fullerton, Pa...*p. 92*
Johnson & Co., Inc., J. R., P. O. Box 515, Richmond, Va.

Pittsburgh Forge & Iron Co., 1003 Penn Ave., Pittsburgh, Pa.

Pollak Steel Co., Cincinnati, O.

B**BABBITT METAL**

Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.

ALLAN & SON, A., Harrison, N. J...*pp. 286, 287*ATKINS & CO., INC., E. C., Indianapolis, Ind...*p. 385*

Cadman Mfg. Co., A. W., 2814 Smallman St., Pittsburgh, Pa.

Damascus Bronze Co., Pittsburgh, Pa.

Eastwood Wire Mfg. Co., Belleville, N. J.

Empire Metal Co., Syracuse, N. Y.

Frictionless Metal Co. (Frictionless), 1103 Chestnut St., Chattanooga, Tenn.

Jacobson & Sons' Co., I. M. (Motex), 70-72 Catherine St., Detroit, Mich.

Leddell Metals Co., Inc., 281 Borden Ave., Long Island City, N. Y.

Lubricating Metal Co., 2 Rector St., New York.

LUMEN BEARING CO., Buffalo, N. Y...*p. 290*

Magnolia Metal Co., 113-115 Bank St., New York.

Axi

Marx & Sons, A., 1645 Tchoupitoulas St., New Orleans, La.

Merchant & Evans Co. 2019-2035 Washington Ave., Philadelphia, Pa.

Murdoch & Co., H., 432 Wood St., Pittsburgh, Pa.

Muzzy-Lyon Co., Detroit, Mich.

National Lead Co., 111 Broadway, New York.

Pacific Metal Works, 153 First St., San Francisco, Cal.

Pittsburgh White Metal Co., 160 Leroy St., New York.

*POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md...*pp. 196, 197*REEVES PULLEY CO., Columbus, Ind...*p. 210*

Riverside Metal Refining Co., Connellsville, Pa.

RYERSON & SON, JOSEPH T., 16th & Rockwell Sts., Chicago, Ill...*p. 366*

Syracuse Smelting Works, 192 Diamond St., Brooklyn, N. Y.

UNITED LEAD CO., 111 Broadway, New York...*p. 299**WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa...*pp. 114, 115***BAFFLES, BOILER**

Engineer Co., 17 Battery Place, New York.

BAG FILLING MACHINES

Brown Bag Filling Machine Co., 20 Main St., Fitchburg, Mass.

*POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md...*pp. 196, 197***BAG MAKING MACHINES**

Brown Bag Filling Machine Co., 20 Main St., Fitchburg, Mass.

BAKERS, MACHINERY

Ruger Mfg. Co., J. W., 222 Chicago St., Buffalo, N. Y.

BALANCES, SPRING

Chatillon & Sons, John, 85 93 Cliff St., New York.

Computing Scale Co., Dayton, O.

BALANCES AND WEIGHTS

Ainsworth & Sons, William, 2151 Lawrence St., Denver, Colo.

Central Scientific Co., 460 E. Ohio St., Chicago, Ill.

Standard Scientific Co., 70 Fifth Ave., New York.

Torsion Balance Co., 92 Reade St., New York.

BALANCING MACHINES

Carlson-Wenstrom Co., Erie Ave. & Richmond St., Philadelphia, Pa.

NORTON GRINDING CO., Worcester, Mass...*p. 362**VIBRATION SPECIALTY CO., Harrison Bldg., Philadelphia, Pa...*p. 487***BALL BEARINGS, CRANKS, GAGES, JOINTS, MILLS, ETC.**

(See Bearings, Cranks, Gages, Joints, Mills, etc., Ball)

BALL CUPS, PRESSED STEELBOSSERT CORP'N, Utica, N. Y...*p. 301*
Matthews Mfg. Co., 104 Gold St., Worcester, Mass.WORCESTER PRESSED STEEL CO., Worcester, Mass...*p. 305*

Worcester Stamped Metal Co., 9 Hunt St., Worcester, Mass.

BALL WINDING MACHINES

Franklin Machine Co., 189 Charles St., Providence, R. I.

BALLS**—Brass and Bronze***ATLAS BALL CO., Glenwood Ave. at 4th St., Philadelphia, Pa...*p. 233*AUBURN BALL BEARING CO., 22 Elizabeth St., Rochester, N. Y...*p. 215*

Draper Mfg. Co., 2417 Wright St., Port Huron, Mich.

*GWILLIAM CO., 253 W. 58th St., New York...*pp. 234, 235*

Hoover Steel Ball Co., Ann Arbor, Mich.

Jones Ball Co., Arlington Heights, Mass.

MARK MFG. CO., P. O. Box G, Chicago, Ill...*p. 160*

Rochester Ball Bearing Co., Inc., 203 State St., Rochester, N. Y.

Watertown Specialty Co., 124 E. Moulton St., Watertown, N. Y.

—Burnishing

Abbott Ball Co., Elmwood, Conn.

*ATLAS BALL CO., Glenwood Ave. at 4th St., Philadelphia, Pa...*p. 233*AUBURN BALL BEARING CO., 22 Elizabeth St., Rochester, N. Y...*p. 215**GWILLIAM CO., 253 W. 58th St., New York...*pp. 234, 235***—Steel**

Abbott Ball Co., Elmwood, Conn.

*ATLAS BALL CO., Glenwood Ave. at 4th St., Philadelphia, Pa...*p. 233*AUBURN BALL BEARING CO., 22 Elizabeth St., Rochester, N. Y...*p. 215*

Ball & Roller Bearing Co., Danbury, Conn.

Federal Bearings Co., Inc., 110 William St., Poughkeepsie, N. Y.

*GWILLIAM CO., 253 W. 58th St., New York...*pp. 234, 235*

Haring, Ellsworth, 114 Liberty St., New York

Hoover Steel Ball Co., Ann Arbor, Mich.

Jones Ball Co., Arlington Heights, Mass.

NEW DEPARTURE MFG. CO., Bristol, Conn...*pp. 222, 223, 224, 225*

Rochester Ball Bearing Co., Inc., 203 State St., Rochester, N. Y.

STANDARD ROLLER BEARING CO., Philadelphia, Pa...*pp. 230, 231*

Tioga Steel & Iron Co., 52nd & Gray's Ave., Philadelphia, Pa.

BAR IRONGLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa...*p. 68*

Interstate Iron & Steel Co., 104 S. Michigan Ave., Chicago, Ill.
 Lockhart Iron & Steel Co., Pittsburgh, Pa.
 MILTON MFG. CO., Milton, Pa...p. 406
 Nicetown Plate Washer Co., Nicetown, Philadelphia, Pa.
 Pittsburgh Forge & Iron Co., 1003 Penn Ave., Pittsburgh, Pa.
 Reading Iron Co., Reading, Pa.
 St. Louis Screw Co., St. Louis, Mo.

BAR STEEL

Carbon Steel Co., P. O. Box 1591, Pittsburgh, Pa.
 Illinois Steel Co., 208 S. La Salle St., Chicago, Ill.

Interstate Iron & Steel Co., 104 S. Michigan Ave., Chicago, Ill.
 Lockhart Iron & Steel Co., Pittsburgh, Pa.
 Pardee Works, C., Perth Amboy, N. J.
 Standard Screw Products Co., Bellevue & Warren Ave., Detroit, Mich.
 WHEELOCK, LOVEJOY & CO., 23 Cliff St., New York...p. 301

BAROMETERS

Green, Henry J., 1191 Bedford Ave., Brooklyn, N. Y.

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y...p. 335

UEHLING INSTRUMENT CO., 2011 Empire Bldg., New York...p. 525

BAROMETRIC CONDENSERS

(See Condensers, Barometric)

BARREL FILLERS (Automatic)

MORRISON BROS., Dubuque, Ia...p. 495

BARREL SAND-BLASTS

NEW HAVEN SAND BLAST CO., New Haven, Conn...p. 459

*PANGBORN CORP'N, P. O. Box 859, Hagerstown, Md...pp. 460, 461

BARRELS (Metal)

Butler Mfg. Co., 1326 Grand Ave., Kansas City, Mo.

Cleveland Wire Spring Co., Cleveland, O.

*SCAIFE & SONS CO., WM. B., Pittsburgh, Pa...pp. 103, 498

BARS**—Bearing Bronze**

*AMERICAN BRONZE CORP'N, (Non-Gran), Berwyn, Pa...pp. 288, 289

—Boring

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...p. 397

—Merchant

Franklin Steel Works, Franklin, Pa.
 Lackawanna Steel Co., Buffalo, N. Y.
 Youngstown Sheet & Tube Co., Youngstown, O.

—Reinforcing (Concrete Work)

AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa...p. 200

Atlantic Steel Co., Atlanta, Ga.

Concrete Steel Co., 42 Broadway, New York.

Franklin Steel Works, Franklin, Pa.

—Staybolt

Falls Hollow Staybolt Co., 21 E. Portage St., Cuyahoga Falls, O.

—Steel

Atlantic Steel Co., Atlanta, Ga.

Cincinnati Iron & Steel Co., Cincinnati, O.

Concrete Steel Co., 42 Broadway, New York.

GLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa...p. 68

Jessop & Sons, Inc., Wm., 91 John St., New York

Nicotown Plate Washer Co., Nicetown, Philadelphia, Pa.

PENNSYLVANIA FORGE CO., Bridesburg, Philadelphia, Pa...p. 158

Tacony Steel Co., Tacony, Philadelphia, Pa.

WHEELOCK, LOVEJOY & CO., 23 Cliff St., New York...p. 301

BATTERIES, STORAGE

Edison Storage Battery Co., Orange, N. J.
 Electric Storage Battery Co., Allegheny Ave. & 19th St., Philadelphia, Pa.
 Hutchinson, Inc., Miller Reese, Orange, N. J.
 U. S. Light & Heat Corp'n, Niagara Falls, N. Y.

Waterbury Battery Co., Waterbury, Conn.

Willard Storage Battery Co., Cleveland, O.

Witherbee Igniter Co., 132 Liberty St., Springfield, Mass.

BEADING MACHINES

TOLEDO MACHINE & TOOL CO., Toledo, O...p. 313

BEARING METALS

(See Metals, Bearing)

BEARING TESTING MACHINES

OLSEN TESTING MACHINE CO., TINIUS, 600 N. 12th St., Philadelphia, Pa...p. 511

RIEHL BROS. TESTING MACHINE CO., 1424 N. 9th St., Philadelphia, Pa...p. 512

BEARINGS**—Aluminum**

Paulson & Son, Inc., Thomas, 97 Second Ave., Brooklyn, N. Y.

—Babbitt (Die Cast)

*DOEHLER DIE-CASTING CO., Brooklyn, N. Y...p. 292

"Indiana" Die Casting Co., 1016 E. 11th St., Indianapolis, Ind.

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill...p. 194

LUMEN BEARING CO., Buffalo, N. Y...p. 290

Michigan Smelting & Refining Co., Detroit, Mich.

Milwaukee Die Casting Co., 297 Fourth St., Milwaukee, Wis.

Muzzy-Lyon Co., Detroit, Mich.

Parker White Metal & Machine Co., 23rd & R. R. Sts., Erie, Pa.

Precision Castings Co., Inc., P. O. Drawer 47, Syracuse, N. Y.

STEWART MFG. CORP'N, 4535-4551 Fullerton Ave., Chicago, Ill...p. 293

UNITED LEAD CO., 111 Broadway, New York...p. 299

—Ball

Ahlberg Bearing Co., 2636 Michigan Ave., Chicago, Ill.

AUBURN BALL BEARING CO., 22 Elizabeth St., Rochester, N. Y...p. 215

Ball & Roller Bearing Co., Danbury, Conn.

Bantam Ball Bearing Co., Bantam, Conn.

Bearings Co. of America, Lancaster, Pa.

Carlson-Wenstrom Co., Erie & Richmond St., Philadelphia, Pa.

*FAFNIR BEARING CO., New Britain, Conn...p. 216

Federal Bearings Co., Inc., 110 William St., Poughkeepsie, N. Y.

G-A Ball Bearing Mfg. Co., 123-141 Albany Ave., Chicago, Ill.

*GURNEY BALL BEARING CO., Jamestown, N. Y...pp. 218, 219

*GWILLIAM CO., 253 W. 58th St., New York...pp. 234, 235

HESS-BRIGHT MFG. CO., Philadelphia, Pa...p. 217

Imperial Bearing Co., Detroit, Mich.

Iron City Products Co., Pittsburgh, Pa.

Joy Ball Bearing Co., 407-415 S. Aberdeen St., Chicago, Ill.

NEW DEPARTURE MFG. CO., Bristol, Conn...pp. 222, 223, 224, 225

Nice Ball Bearing Co. Land Title Bldg., Philadelphia, Pa.

*NORMA CO. OF AMERICA, 1790 Broadway, New York...p. 226

Rhineland Machine Works Co., 1737 Broadway, New York

R. I. V. Co., 1765 Broadway, New York

Rochester Ball Bearing Co., Inc., 203 State St., Rochester, N. Y.

Bea

BEARINGS (Continued)**—Ball**

Salisbury Ball Bearing Corp'n, Jamestown, N. Y.
 Schafer Ball Bearings Co., Inc., 1790 Broadway,
 New York
 Schatz Mfg. Co., Poughkeepsie, N. Y.
 S K F BALL BEARING CO., (S K F), Hart-
 ford, Conn., *pp. 227*
 Standard Machinery Co., Auburn, R. I.
 STANDARD ROLLER BEARING CO., Phila-
 delphia, Pa., *pp. 230, 231*
 Transmission Ball Bearing Co., Inc., 1050
 Military Road, Buffalo, N. Y.
 U. S. BALL BEARING MFG. CO., Palmer
 St. & Kolmar Ave., Chicago, Ill., *p. 232*

—Ball (Reground)

Ahlberg Bearing Co., 2636 Michigan Ave.,
 Chicago, Ill.
 *GWILLIAM CO., 253 W. 58th St., New
 York., *pp. 234, 235*
 HESS-BRIGHT MFG. CO., Philadelphia,
 Pa., *p. 217*

—Bronze

ALLAN & SON, A., Harrison, N. J., *pp.*
286, 287
 Aluminum Castings Co., 6205 Carnegie Ave.,
 Cleveland, O.
 *AMERICAN BRONZE CORP'N, (Non-
 Gran), Berwyn, Pa., *pp. 288, 289*
 Bound Brook Oil-Less Bearing Co., Bound
 Brook, N. J.
 BUNTING BRASS & BRONZE CO., 729
 Spencer St., Toledo, O., *p. 285*
 CALDWELL CO., INC., W. E., 240 E.
 Brandeis St., Louisville, Ky., *p. 201*
 Damascus Bronze Co., Pittsburgh, Pa.
 DODGE SALES & ENGINEERING CO.,
 Mishawaka, Ind., *pp. 102, 202, 203, 204,*
205, 206
 *DOEHLER DIE-CASTING CO., Brooklyn,
 N. Y., *p. 292*

Bea

JONES FOUNDRY & MACHINE CO., W. A.,
 4401 W. 12th St., Chicago, Ill., *p. 194*
 LUMEN BEARING CO., Buffalo, N. Y., *p.*
290
 Metaline Co., West Ave. near Borden, Long
 Island City, N. Y.
 Muzzy-Lyon Co., Detroit, Mich.
 Paulson & Son, Inc., Thomas, 97 Second Ave.,
 Brooklyn, N. Y.
 Pittsburgh Brass Mfg. Co., Penn Ave. & 32nd
 St., Pittsburgh, Pa.
 UNITED LEAD CO., 111 Broadway, New
 York., *p. 299*

—Bronze (Babbitt-Lined)

*DOEHLER DIE-CASTING CO., Brooklyn,
 N. Y., *p. 292*
 Milwaukee Die Casting Co., 297 Fourth St.,
 Milwaukee, Wis.

—Combined Radial and Thrust

*FAFNIR BEARING CO., New Britain,
 Conn., *p. 216*
 *GURNEY BALL BEARING CO., James-
 town, N. Y., *pp. 218, 219*
 *GWILLIAM CO., 253 W. 58th St., New
 York., *pp. 234, 235*
 Joy Ball Bearing Co., 407-415 S. Aberdeen St.,
 Chicago, Ill.
 NEW DEPARTURE MFG. CO., Bristol,
 Conn., *pp. 222, 223, 224, 225*
 *NORMA CO. OF AMERICA, 1790 Broadway,
 New York., *p. 226*
 U. S. BALL BEARING MFG. CO., Palmer
 St. & Kolmar Ave., Chicago, Ill., *p. 232*

—Graphite

Bound Brook Oil-Less Bearing Co., Bound
 Brook, N. J.
 Randall Graphite Sheet Lubricator Co., 816-
 818 W. Lake St., Chicago, Ill.

—Oilless

Arguto Oilless Bearing Co. (Arguto), Wayne
 Junction, Philadelphia, Pa.
 Bound Brook Oil-Less Bearing Co., Bound
 Brook, N. J.

Jacobson & Sons Co., I. M. (Motex), 70-
 72 Catherine St., Detroit, Mich.
 Metaline Co., West Ave. near Borden, Long
 Island City, N. Y.
 Nolu Oilless Bearing Co., 6 E. Johnson St.,
 Germantown, Philadelphia, Pa.
 UNITED LEAD CO., 111 Broadway, New
 York., *p. 299*

—Pressed Steel

*GWILLIAM CO., 253 W. 58th St., New
 York., *pp. 234, 235*

—Roller

American Roller Bearing Co., 600 Melwood
 Ave., Pittsburgh, Pa.
 Ball & Roller Bearing Co., Danbury, Conn.
 Bantam Ball Bearing Co., Bantam, Conn.
 *GWILLIAM CO., 253 W. 58th St., New
 York., *pp. 234, 235*
 HYATT ROLLER BEARING CO., Metro-
 politan Tower, New York., *pp. 220, 221*
 Makutchan Roller Bearing Co., 1542 McCor-
 mick Bldg., Chicago, Ill.
 *NORMA CO. OF AMERICA, 1790 Broadway,
 New York., *p. 226*
 Railway Roller Bearing Co., Syracuse, N. Y.
 REEVES PULLEY CO., Columbus, Ind.,
p. 120
 *ROYERSFORD FOUNDRY & MACHINE
 CO., 52 N. 5th St., Philadelphia, Pa.,
pp. 228, 229
 Spicer Mfg. Corp'n, South Plainfield, N. J.
 STANDARD ROLLER BEARING CO., Phila-
 delphia, Pa., *pp. 230, 231*
 Suspension Bearing Co., Spartanburg, S. C.
 Timken Roller Bearing Co., Deuber Ave.,
 Canton, O.
 U. S. BALL BEARING MFG. CO., Palmer
 St. & Kolmar Ave., Chicago, Ill., *p. 232*

—Self-Oiling

*BROWN CO., A. & F., 79 Barclay St.,
 New York., *p. 187*
 CALDWELL CO., INC., W. E., 340 E.
 Brandeis St., Louisville, Ky., *p. 201*
 *CHAIN BELT CO., 735 Park St., Milwaukee,
 Wis., *pp. 118, 119*
 DODGE SALES & ENGINEERING CO.,
 Mishawaka, Ind., *pp. 102, 202, 203, 204,*
205, 206
 Ehrsam & Sons Mfg. Co., J. B., Enterprise,
 Kan.
 *FALLS CLUTCH & MACHINERY CO.,
 Cuyahoga Falls, O., *p. 207*
 *HILL CLUTCH CO., Cleveland, O., *p. 208*
 JONES FOUNDRY & MACHINE CO., 4401
 W. 12th St., Chicago, Ill., *p. 194*
 *LINK-BELT CO., 39th St. & Stewart Ave.,
 Chicago, Ill., *p. 256*
 Medart Patent Pulley Co., St. Louis, Mo.
 Nolu Oilless Bearing Co., 6 E. Johnson St.,
 Germantown, Philadelphia, Pa.
 Nordyke & Marmon Co., Indianapolis, Ind.
 WELLER MFG. CO., 1820-1856 N. Kostner
 Ave., Chicago, Ill., *pp. 258, 259, 260*

—Thrust

American Ball Co., Providence, R. I.
 American Roller Bearing Co., 600 Melwood
 Ave., Pittsburgh, Pa.
 AUBURN BALL BEARING CO., 22 Eliza-
 beth St., Rochester, N. Y., *p. 215*
 Bantam Ball Bearing Co., Bantam, Conn.
 Bearings Co. of America, Lancaster, Pa.
 DODGE SALES & ENGINEERING CO.,
 Mishawaka, Ind., *pp. 202, 203, 204, 205,*
206
 *FAFNIR BEARING CO., New Britain,
 Conn., *p. 216*
 G-A Ball Bearing Mfg. Co., 123-141 Albany
 Ave., Chicago, Ill.
 *GURNEY BALL BEARING CO., Jamestown,
 N. Y., *pp. 218, 219*
 *GWILLIAM CO., 253 W. 58th St., New
 York., *pp. 234, 235*
 HESS-BRIGHT MFG. CO., Philadelphia,
 Pa., *p. 217*

Advertisements of Arms marked * appear in The Journal, A. S. M. E.

*HILL CLUTCH CO., Cleveland, O...*p.* 208
Joy Ball Bearing Co., 407-15 S. Aberdeen
St., Chicago, Ill.

NEW DEPARTURE MFG. CO., Bristol,
Conn...*pp.* 222, 223, 224, 225

*NORMA CO. OF AMERICA, 1790 Broadway,
New York...*p.* 226

Railway Roller Bearing Co., Syracuse, N. Y.

*ROVERSFORD FOUNDRY & MACHINE
CO., 52 N. 5th St., Philadelphia, Pa...*pp.*
228, 229

S K F BALL BEARING CO. (S K F), Hart-
ford, Conn...*p.* 227

Standard Machinery Co., Auburn, R. I.

Suspension Bearing Co., Spartanburg, S. C.

Timken Roller Bearing Co., Deubar Ave.,
Canton, Ohio.

U. S. BALL BEARING MFG. CO., Palmer
St. & Kolmar Ave., Chicago, Ill...*p.* 232

BEDS, RUBBING

*CALDWELL & SON CO., H. W., 17th St.
& Western Ave., Chicago, Ill...*p.* 250

FLORY MFG. CO., S., Bangor, Pa...*p.* 269

BELT ADJUSTERS

AMERICAN TOOL & MACHINE CO.,
Boston, Mass...*p.* 490

Cleveland Fabric Belting Co., 1473 W. 110th
St., Cleveland, O.

BELT CONVEYORS

(See Conveyors, Belt)

BELT DRESSING

Beltine Chemical & Mfg. Co., 401 N. Sangamon
St., Chicago, Ill.

Black Bear Co., 138-144 Temple St., Long
Island City, N. Y.

Bradford Belting Co., 202 Walnut St., Cin-
cinnati, O.

Chesapeake Belting Co., 813-823 Homewood
Ave., Baltimore, Md.

Cling-Surface Co., 1048 Niagara St., Buffalo,
N. Y.

CRESCENT BELT FASTENER CO., 381
Fourth Ave., New York...*pp.* 246, 247

Gandy Belting Co., 726-740 W. Pratt St.,
Baltimore, Md.

GRATON & KNIGHT MFG. CO., Worces-
ter, Mass...*p.* 237

Gripwell Pulley Covering Co., 157 Cedar St.,
New York

Jobbers Mfg. Co. (Blue-Ribbon), 327 S. La
Salle St., Chicago, Ill.

Ladew Co., Inc., Edward R., Glen Cove, N.
Y.

Laurence Belting Co., Inc., 111 Chambers St.,
New York

Mount Vernon Belting Co., 327-333 Warren
Ave., Baltimore, Md.

O'Brien-Northrop Oil & Chem. Co., St. Louis,
Mo.

Palmer & Co., N., Bridgeport, Conn.

Ranville Co., F., Grand Rapids, Mich.

Reed & Duecker, Memphis, Tenn.

RHOADS & SONS, J. E., 12 N. Third St.,
Philadelphia, Pa...*pp.* 238, 239

Ruboil Belting Co., 8th & Wallace Sts., Phila-
delphia, Pa.

Salisbury & Co., W. H., 308-310 W. Madison
St., Chicago, Ill.

*SCHIEREN CO., CHAS. A., 30-38 Ferry
St., New York...*p.* 240

SHULTZ BELTING CO., St. Louis, Mo...
p. 241

Stephenson Mfg. Co., P. O. Box 380, Albany,
N. Y.

*THE TEXAS COMPANY, 17 Battery Place,
New York...*p.* 175

Ulmer Leather Co., Norwiche, Conn.

Victor Balata & Textile Belting Co., 38 Murray
St., New York

Watt's Sons, John M., 54 N. Second St., Phila-
delphia, Pa.

White & Bagley Co., 100 Foster St., Worcester,
Mass.

BELT FASTENERS

ATKINS & CO., INC., E. C., Indianapolis,
Ind...*p.* 385

Clipper Belt Lacer Co., 974-1014 Front Ave.,
N. W., Grand Rapids, Mich.

CRESCENT BELT FASTENER CO. (Cres-
cent), 381 Fourth Ave., New York...
pp. 246, 247

*FLEXIBLE STEEL LACING CO. (Alligator),
522 S. Clinton St., Chicago, Ill...*p.* 248

Gandy Belting Co., 726-40 W. Pratt St.,
Baltimore, Md.

*GREENE, TWEED & CO., 109 Duane St.,
New York...*p.* 168

Main Belting Co., 1217-1241 Carpenter St.,
Philadelphia, Pa.

BELT LACERS

Clipper Belt Lacer Co., 974-1014 Front Ave.,
N. W., Grand Rapids, Mich.

BELT LACING

Chicago Rawhide Mfg. Co., 1301 Elston St.,
Chicago, Ill.

Eagle Counter & Leather Co., 414 E. 8th St.,
Cincinnati, O.

GRATON & KNIGHT MFG. CO., Worces-
ter, Mass...*p.* 237

*GREENE, TWEED & CO., 109 Duane St.,
New York...*p.* 168

Meiers-Andres Belting Co., 128 Mulberry St.,
Newark, N. J.

New York Leather Belting Co., 465 Kent Ave.,
Brooklyn, N. Y.

Palmer & Co., N., Bridgeport, Conn.

RHOADS & SONS, J. E., 12 N. Third St.,
Philadelphia, Pa...*pp.* 238, 239

*SCHIEREN CO., CHAS. A., 30-38 Ferry St.,
New York...*p.* 240

Shackley & Son, Co. W. T., 49 High St., Bos-
ton, Mass.

Williams & Sons, I. B., 9 Orchard St., Dover,
N. H.

—Hinge

BRISTOL CO., Waterbury, Conn...*p.* 530

Clipper Belt Lacer Co., 974-1014 Front Ave.,
N. W., Grand Rapids, Mich.

*FLEXIBLE STEEL LACING CO. (Alligator),
522 S. Clinton St., Chicago, Ill...*p.* 248

Page Belting Co., Concord, N. H.

BELT TIGHTENERS

AMERICAN TOOL & MACHINE CO., Bos-
ton, Mass...*p.* 490

*BROWN CO., A. & F., 79 Barclay St., New
York...*p.* 187

*CALDWELL & SON CO., H. W., 17th St.
& Western Ave., Chicago, Ill...*p.* 250

DODGE SALES & ENGINEERING CO.,
Mishawaka, Ind...*pp.* 102, 202, 203, 204,
205, 206

*FALLS CLUTCH & MACHINERY CO.,
Cuyahoga Falls, O...*p.* 207

*FULLER-LEHIGH CO., Fullerton, Pa...
p. 92

*HILL CLUTCH CO., Cleveland, O...*p.* 208

HOGGSON & PETTIS MFG. CO., New
Haven, Conn...*pp.* 394, 395, 396

*LINK-BELT CO., 39th St. & Stewart Ave.,
Chicago, Ill...*p.* 256

Munson Mill Machinery Co., Inc., 405 Broad-
way, Utica, N. Y.

Smith & Co., F. L. (Lenix), 50 Church St.,
New York

WELLER MFG. CO., 1820-1856 N. Kostner
Ave., Chicago, Ill...*pp.* 258, 259, 260

*WOODS SONS CO., T. B., Chambersburg,
Pa...*pp.* 212, 213

BELTING

—Angular

RHOADS & SONS, J. E., 12 N. Third St.,
Philadelphia, Pa...*pp.* 238, 239

Sumner Belting Co., Wm., Tolland, Conn.

—Balata

Bonner & Barnwall, Inc., 30 Church St., New
York

Bel

BELTING (Continued)**—Balata**

Dick, Ltd., R. & J. (Dickbelt), Passaic, N. J.
 Manheim Mfg. & Belting Co., Manheim, Pa.
 Republic Rubber Corp'n, Youngstown, O.
 Victor Balata & Textile Belting Co., 38 Murray St., New York

—Canvas

Acme Belting Co., Niles, Mich.
 Burrell Belting Co., 413-417 S. Hermitage Ave., Chicago, Ill.
 Hettrick Mfg. Co., Toledo, O.
 Imperial Belting Co. (Rexall), 400 N. Kinzie St., Chicago, Ill.
 Johnson Belting Co., 342 E. 38th St., New York
 Main Belting Co., 1217-1241 Carpenter St., Philadelphia, Pa.
 Nott Co., W. S., 201-211 N. Third St., Minneapolis, Minn.

—Canvas (Stitched)

Chesapeake Belting Co., 813-823 Homewood Ave., Baltimore, Md.
 McIlroy Belting & Hose Co., Hammond, Ind.
 Manheim Mfg. & Belting Co., Manheim, Pa.
 Mount Vernon Belting Co., 327-333 Warren Ave., Baltimore, Md.
 National Leather Belting Co., 342 E. 38th St., New York

—ROSSENDALE-REDDAWAY BELTING & HOSE CO., Newark, N. J. . . p. 243

Ruboil Belting Co., 8th & Wallace Sts., Philadelphia, Pa.

Victor Balata & Textile Belting Co., 38 Murray St., New York

—Chain Link

(See Chain Belts and Links)

—Conveyor

Boston Belting Co., 84 Linden Park St., Boston, Mass.
 Burrell Belting Co., 413-417 S. Hermitage Ave., Chicago, Ill.

Bel

Dick, Ltd., R. & J. (Dickbelt), Passaic, N. J.
 Gilmer Co., L. H., Tacony, Philadelphia, Pa.
 GOODRICH RUBBER CO., B. F., Akron, O. . . pp. 183, 242

Goodyear Tire & Rubber Co., Akron, O.
 Hamilton Rubber Mfg. Co., Trenton, N. J.

Hettrick Mfg. Co., Toledo, O.
 Imperial Belting Co. (Rexall), 400 N. Kinzie St., Chicago, Ill.

LAMSON CO., 100 Boylston St., Boston, Mass. . . pp. 254, 255

Manhattan Rubber Mfg. Co., 61 Willett St., Passaic, N. J.

Manheim Mfg. & Belting Co., Manheim, Pa.
 Mount Vernon Belting Co., 327-333 Warren Ave., Baltimore, Md.

NEW YORK RUBBER CO., 34 Reade St., New York. . . pp. 244, 245

Paulus & Co., Jos. C., 2507-11 Potter St., Philadelphia, Pa.

Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.

Republic Rubber Corp'n, Youngstown, O.

ROBINS CONVEYING BELT CO., Park Row Bldg., New York. . . p. 257

ROSSENDALE-REDDAWAY BELTING & HOSE CO., Newark, N. J. . . p. 243

Ruboil Belting Co., 8th & Wallace Sts., Philadelphia, Pa.

Scandinavia Belting Co., 106-108 Reade St., New York

Stanley Belting Corp'n, 40 S. Clinton St., Chicago, Ill.

Victor Balata & Textile Belting Co., 38 Murray St., New York

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill. . . pp. 258, 259, 260

—Cotton

Acme Belting Co., Niles, Mich.

Bonner & Barnwall, Inc., 30 Church St., New York

Cleveland Fabric Belting Co., 1473 W. 110th St., Cleveland, O.

Empire Mfg. Co., 97 Spring Street, Lockport, N. Y.

McIlroy Belting & Hose Co., Hammond, Ind.

Nott Co., W. S., 201-211 N. Third St., Minneapolis, Minn.

ROSSENDALE-REDDAWAY BELTING & HOSE CO., Newark, N. J. . . p. 243

Scandinavia Belting Co., 106-108 Reade St., New York

Stanley Belting Corp'n, 40 S. Clinton St., Chicago, Ill.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill. . . pp. 258, 259, 260

—Cotton-Leather

Sumner Belting Co., Wm., Tolland, Conn.

—Elevator

Dick, Ltd., R. & J. (Dickbelt), Passaic, N. J.

GOODRICH RUBBER CO., B. F., Akron, O. . . pp. 183, 242

Imperial Belting Co. (Rexall), 400 N. Kinzie St., Chicago, Ill.

—Endless

Acme Belting Co., Niles, Mich.

Gilmer Co., L. H., Tacony, Philadelphia, Pa.

GOODRICH RUBBER CO., B. F., Akron, O. . . pp. 183, 242

GRATON & KNIGHT MFG. CO., Worcester, Mass. . . p. 237

Hettrick Mfg. Co., Toledo, O.

RHOADS & SONS, J. E., 12 N. Third St., Philadelphia, Pa. . . pp. 238, 239

Scandinavia Belting Co., 106-108 Reade St., New York

Walls Tool & Supply Co., T. P. (Marathon), 75-77 Walker St., New York

—Fabric

Acme Belting Co., Niles, Mich.

Burrell Belting Co., 413-417 S. Hermitage Ave., Chicago, Ill.

Cleveland Fabric Belting Co., 1473 W. 110th St., Cleveland, O.

Fabreeka Belting Co., Burlington, Vt.

ROSSENDALE-REDDAWAY BELTING & HOSE CO., Newark, N. J. . . p. 243

Stanley Belting Corp'n, 40 S. Clinton St., Chicago, Ill.

—Fabric (Leather Faced)

Peerless Belting Co., Gardenville Station, Buffalo, N. Y.

—Hair

ROSSENDALE-REDDAWAY BELTING & HOSE CO., Newark, N. J. . . p. 243

Scandinavia Belting Co., 106-108 Reade St., New York

—Leather

Albany Belting & Supply Co., 372 Broadway, Albany, N. Y.

Alexander Bros., 414 N. 3rd St., Philadelphia, Pa.

American Belting & Tanning Co., 135 Oliver St., Boston, Mass.

Barnes Co., Henry K., 234 Devonshire St., Boston, Mass.

Bay State Belting Co., 605 Atlantic Ave., Boston, Mass.

Bickford & Francis Belting Co., Buffalo, N. Y.

Bond Co., Charles, 520 Arch St., Philadelphia, Pa.

Bonner & Barnwall, Inc., 30 Church St., New York

Bradford Belting Co., 202 Walnut St., Cincinnati, O.

California Belting Co., Inc., 1459-61-63 Mission St., San Francisco, Cal.

Central Belting Co., 151 Lafayette St., New York

Chicago Belting Co., 113 N. Green St., Chicago, Ill.

Chicago Rawhide Mfg. Co., 1301 Elston St., Chicago, Ill.

Coe & Brown Co., New Haven, Conn.

Consolidated Belting Co., 2 Jeffrey St., Chester, Pa.

Cook Belting Co., H. N., 401 Howard St., San Francisco, Cal.
 Couse & Bolton, 42 Lafayette St., Newark, N. J.
 Covell Belting Co., 41 N. 7th St., Philadelphia, Pa.
 Cowan & Co., Andrew, Louisville, Ky.
 Cross Bros. & Co., 112-114 Mill St., Rochester, N. Y.
DETROIT OAK BELTING CO., Detroit, Mich., *p.* 236
 Druid Oak Belting Co., Inc., 111 E. Lombard St., Baltimore, Md.
 Eagle Counter & Leather Co., 414 E. 8th St., Cincinnati, O.
 Etsweiler Co., William, 230 N. 3rd St., Philadelphia, Pa.
 Evansville Leather & Belting Co., 429 Sycamore St., Evansville, Ind.
 Forster Co., John M., 110 Mill St., Rochester, N. Y.
 Gandy Belting Co., 726-740 W. Pratt St., Baltimore, Md.
 Grand Rapids Belting Co., 1-3 Ionia Ave., Grand Rapids, Mich.
GRATON & KNIGHT MFG. CO., Worcester, Mass., *p.* 237
 Hide, Leather & Belting Co., Indianapolis, Ind.
 Himmelein & Bailey, 248 Chestnut St., Philadelphia, Pa.
 Holyoke Belting Co., 66-68 Winter St., Holyoke, Mass.
 Horton Machine Works, Elmira, N. Y.
 Houghton & Co., E. F., 240 W. Somerset St., Philadelphia, Pa.
 Hudson Belting Co., Worcester, Mass.
 Ireson, Charles L., 221 High St., Boston, Mass.
 Jewell Belting Co., Hartford, Conn.
 Johnson Belting Co., 342 E. 38th St., New York
 Ladew Co., Inc., Edward R., Glen Cove, N. Y.
 Laurence Belting Co., Inc., 111 Chambers St., New York
 McCauley Belting Co., 412-430 Orleans St., Chicago, Ill.
 MacWatty Belting Co., 7 Beverly St., Providence, R. I.
 Meiers-Andres Belting Co., 128 Mulberry St., Newark, N. J.
 Missouri Belting Co., 1021-29 S. Grand Ave., St. Louis, Mo.
 Moloney Belting Co., 130 N. Franklin St., Chicago, Ill.
 Mooney Belting Co., Cincinnati, O.
 National Leather Belting Co., 342 E. 38th St., New York
 New York Leather Belting Co., 465 Kent Ave., Brooklyn, N. Y.
 Norwich Belting Co., Norwich, Conn.
 Nott Co., W. S., 201-211 N. Third St., Minneapolis, Minn.
 Olmsted-Flint Co., Cambridge, Mass.
 Page Belting Co., Concord, N. H.
 Palmer & Co., N., Bridgeport, Conn.
 Paulus & Co., Jos. C., 2507-11 Potter St., Philadelphia, Pa.
 Philadelphia Belting Co., Sixth & Spring Garden Sts., Philadelphia, Pa.
 Rahmann & Co., G., 31 Spruce St., New York
 Ranville Co., F., Grand Rapids, Mich.
 Reed & Ducker, Memphis, Tenn.
RHOADS & SONS, J. E., 12 N. Third St., Philadelphia, Pa., *pp.* 238, 239
 Richie Crawford Co., 406 N. 3rd St., Philadelphia, Pa.
 Rockford Belting Co., Rockford, Ill.
 Salisbury & Co., W. H., 308-310 W. Madison St., Chicago, Ill.
***SCHIEREN CO.**, CHAS. A., 30-38 Ferry St., New York, *p.* 240
 Schwartz Belting Co., 76 Murray St., New York
 Shackley & Son Co., W. T., 49 High St., Boston, Mass.

SHULTZ BELTING CO., St. Louis, Mo., *p.* 241
 Sikes Co., S. R., Cor. 11th Ave. So. & 3rd St., Minneapolis, Minn.
 Smyth-Despard Co., Broad & John Sts., Utica, N. Y.
 Southern Belting Co., Atlanta, Ga.
 Strong & Hery Co., 301-307 State St., Rochester, N. Y.
 Turner Mfg. Co., J. S., 133 Middle St., Lowell, Mass.
 Ulmer Leather Co., Norwich, Conn.
 Union Belt Co., Fall River, Mass.
 Walker's Sons & Co., Chas. W., 288 Market St., Newark, N. J.
 Warren Co., J. F. & W. H., Worcester, Mass.
WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill., *pp.* 258, 259, 260
 Western Rawhide & Belting Co., 7th Ave. & S. Pierce St., Milwaukee, Wis.
 Whiting, Henry F., Lowell, Mass.
 Williams & Sons, I. B., 9 Orchard St., Dover, N. H.
—Rawhide
 Coupe Co., Ltd., Wm. (Excelsior), South Attleboro, Mass.
 Missouri Belting Co., 1021-29 S. Grand Ave., St. Louis, Mo.
SHULTZ BELTING CO., St. Louis, Mo., *p.* 241
—Round (Solid)
 Central Belting Co., 151 Lafayette, New York
GRATON & KNIGHT MFG. CO., Worcester, Mass., *p.* 237
 Missouri Belting Co., 1021-29 S. Grand Ave., St. Louis, Mo.
 New York Leather Belting Co., 465 Kent Ave., Brooklyn, N. Y.
RHOADS & SONS, J. E., 12 N. Third St., Philadelphia, Pa., *p.* 238, 239
SHULTZ BELTING CO., St. Louis, Mo., *p.* 241
 Sumner Belting Co., Wm., Tolland, Conn.
 Williams & Sons, I. B., 9 Orchard St., Dover, N. H.
—Round (Twist)
 Sumner Belting Co., Wm., Tolland, Conn.
—Rubber
 Anchor Packing Co., 7th & Filbert Sts., Philadelphia, Pa.
 Boston Belting Co., 84 Linden Park St., Boston, Mass.
 Boston Woven Hose & Rubber Co., Cambridge, Mass.
 Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.
 Cincinnati Rubber Mfg. Co., Cincinnati, Ohio
 Consumers Rubber Co., 829 Superior Ave., Cleveland, O.
 Diamond Rubber Co., (Inc.), 555 Ellicott Sqr., Buffalo, N. Y.
 Empire Rubber & Tire Co., Trenton, N. J.
GOODRICH RUBBER CO., B. F., Akron, O., *pp.* 183, 242
 Goodyear Tire & Rubber Co., Akron, O.
 Gutta Percha & Rubber Mfg. Co., 126-128 Duane St., New York
 Hamilton Rubber Mfg. Co., Trenton, N. J.
 Maguire Rubber Co., 200 5th Ave., New York
 Mercer Rubber Co., Hamilton Square, N. J.
 N. J. Car Spring & Rubber Co., Jersey City, N. J.
 New York Belting & Packing Co., 91-93 Chambers St., New York
NEW YORK RUBBER CO., 34 Reade St., New York, *pp.* 244, 245
 Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.
 United States Rubber Co., 1790 Broadway, New York
 Voorhees Rubber Mfg. Co., 18-50 Bostwick Ave., Jersey City, N. J.
WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill., *pp.* 258, 259, 260

Bel

BELTING (Continued)**—Textile**

ROSSENDALE-REDDAWAY BELTING & HOSE CO., Newark, N. J. . . p. 243
 Russell Mfg. Co. (Rusco), Middletown, Conn.
 Scandinavia Belting Co., 106-108 Reade St., New York

—“V” (Leather)

Chicago Belting Co., 113 N. Green St., Chicago, Ill.
 Craig Mfg. Co., Cedar Rapids, Iowa.
 GRATON & KNIGHT MFG. CO., Worcester, Mass. . . p. 237
 RHOADS & SONS, J. E., 12 N. Third St., Philadelphia, Pa. . . pp. 238, 239
 Warren Co., J. F. & W. H., Worcester, Mass.

—Waterproof

American Belting & Tanning Co., 135 Oliver St., Boston, Mass.
 Barnes Co., Henry K., 234 Devonshire St., Boston, Mass.
 Bay State Belting Co., 605 Atlantic Ave., Boston, Mass.
 Central Belting Co., 151 Lafayette St., New York
 Cook Belting Co., H. N., 401 Howard St., San Francisco, Cal.
 Couse & Bolten, 42 Lafayette St., Newark, N. J.
 DETROIT OAK BELTING CO. (Naiad), Detroit, Mich. . . p. 236
 Dick, Ltd., R. & J. Passaic, N. J.
 Druid Oak Belting Co., Inc., 111 E. Lombard St., Baltimore, Md.
 Empire Mfg. Co., 97 Spring Street, Lockport, N. Y.
 Etzweiler Co., William, 230 N. 3rd St., Philadelphia, Pa.
 Grand Rapids Belting Co., 1-3 Ionia Ave., Grand Rapids, Mich.
 GRATON & KNIGHT MFG. CO., Worcester, Mass. . . p. 237
 Himmelein & Bailey, 248 Chestnut St., Philadelphia, Pa.
 Holyoke Belting Co., 66-68 Winter St., Holyoke, Mass.
 Laurence Belting Co., Inc., 111 Chambers St., New York
 McCauley Belting Co., 412-420 Orleans St., Chicago, Ill.
 Meier-Andres Belting Co., 128 Mulberry St., Newark, N. J.
 Moloney Belting Co., 130 N. Franklin St., Chicago, Ill.
 Mooney Belting Co., Cincinnati, O.
 Olmsted-Flint Co., Cambridge, Mass.
 Paulus & Co., Jos. C., 2507-11 Potter St., Philadelphia, Pa.
 Peerless Belting Co., Gardenville Station, Buffalo, N. Y.
 Philadelphia Belting Co., Sixth & Spring Garden Sts., Philadelphia, Pa.
 Rahmann & Co., G., 31 Spruce St., New York
 Reed & Duecker, Memphis, Tenn.
 RHOADES & Sons, J. E., 12 N. Third St., Philadelphia, Pa. . . pp. 238, 239
 Richie Crawford Co., 406 N. 3rd St., Philadelphia, Pa.
 Salisbury & Co., W. H., 308-310 W. Madison St., Chicago, Ill.
 Scandinavia Belting Co., 106-108 Reade St., New York
 *SCHIEREN CO., CHAS. A., 30-38 Ferry St., New York. . . p. 240
 Schwartz Belting Co., 76 Murray St., New York
 SHULTZ BELTING CO., St. Louis, Mo. . . p. 241
 Warren Co., J. F. & W. H., Worcester, Mass.
—Web
 Gilmer Co., L. H., Tacony, Philadelphia, Pa.
—Wire
 Webb Mfg. Co., Foot of Centre St., Newark, N. J.
BENCH LEGS
 AMERICAN TOOL & MACHINE CO., Boston, Mass. . . p. 490

D & W FUSE CO., Providence, R. I. . . p. 393
 Gardner General Foundry Co., Gardner, Mass.
 Garwood Bronze & Iron Works, Garwood, N. J.
 *HILL CLUTCH CO., Cleveland, O. . . p. 208
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . p. 194
 NEW BRITAIN MACHINE CO., New Britain, Conn. . . p. 336

BENDING AND STRAIGHTENING MACHINES

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis. . . p. 455
 Kane & Roach, Niagara & Shonnard Sts., Syracuse, N. Y.
 Kling Bros. Engineering Works, 1302-1332 N. Kostner Ave., Chicago, Ill.
 LONG & ALLSTATTER CO., Hamilton, O. . . p. 309
 Medart Patent Pulley Co., St. Louis, Mo.
 NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344
 SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa. . . p. 456
 TORRINGTON MFG. CO., Torrington, Conn. . . p. 483
 WATSON-STILLMAN CO., 35 Church St., New York. . . p. 457
 WILLIAMS, WHITE & CO., Moline, Ill. . . p. 314
 WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

—Pipe and Tube

Cox Engrg. & Tube Bending Machine Works, J. Fillmore, 681-687 Boulevard, Bayonne, N. J.
 Skinner Co., M. B., 558-562 Washington Boul., Chicago, Ill.

BENDING MACHINES**—Angle and Flats**

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis. . . p. 455

—Eye

WILLIAMS, WHITE & CO., Moline, Ill. . . p. 314

—Hand

Hinman & Co., D. A., Sandwich, Ill.

—Hydraulic

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis. . . p. 455
 NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344
 SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa. . . p. 456
 WATSON-STILLMAN CO., 35 Church St., New York. . . p. 457
 WILLIAMS, WHITE & CO., Moline, Ill. . . p. 314
 WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

BENDING ROLLS

(See Rolls, Bending)

BENDS, PIPE

Albright Son & Co., Allentown, Pa.
 Ballwood Co., 30 Church St., New York
 Cox Engrg. & Tube Bending Machine Works, J. Fillmore, 681-687 Boulevard, Bayonne, N. J.
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123
 Lewis, Joseph E., 1218 Warner St., Baltimore, Md.
 Limbert & Co., Geo. B., 570 Fulton St., Chicago, Ill.
 National Valve & Mfg. Co., Pittsburgh, Pa.
 PARKS CO., G. M., Fitchburg, Mass. . . p. 472
 *PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa. . . pp. 132, 133
 SIMMONS CO., JOHN, 110 Center St., New York. . . p. 515
 Simmons Pipe Bending Works, 41 Mechanic St., Newark, N. J.

Bel

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

BENZOL RECOVERY PLANTS

Koppers Co., H., Union Arcade, Pittsburgh, Pa.

BILLETS

—Forging

Andrews Steel Co., Newport, Ky.

Electro Steel Co., Inc., Curry Bldg., Pittsburgh, Pa.

Whitaker-Glessner Co., Wheeling, W. Va.

—Steel

American Tube & Stamping Co., Bridgeport, Conn.

Andrews Steel Co., Newport, Ky.

MARK MFG. CO., P. O. Box G, Chicago, Ill... *p. 160*

Pardee Works, C., Perth Amboy, N. J.

Pittsburgh Steel Co., Union Arcade, Pittsburgh, Pa.

Timken Roller Bearing Co., Denber Ave., Canton, O.

Whitaker-Glessner Co., Wheeling, W. Va.

Wood Iron & Steel Co., Alan, Widener Bldg., Philadelphia, Pa.

BITTS

Murkland Co., J. W., Barton, Vt.

CLEVELAND TWIST DRILL CO., Cleveland, O... *p. 378*

BLACKSMITHS' MACHINERY

Novelty Iron Works Co., Dyersville, Ia.

BLANKETS, RUBBER

GOODRICH RUBBER CO., B. F., Akron, O... *pp. 183, 242*

BLANKING MACHINES, (Multiple Spindle)

NEW BRITAIN MACHINE CO., New Britain, Conn... *p. 336*

BLAST FURNACES, GATES, ETC.

(See Furnaces, Gates, etc., Blast)

BLEACHING MACHINERY

PHILADELPHIA DRYING MACHINERY CO., Stokely St., Philadelphia, Pa... *p. 473*

BLOCKS

—Chain Hoisting

(See Hoists, Chain)

—Die

PENNSYLVANIA FORGE CO., Bridesburg, Philadelphia, Pa... *p. 158*

—Logging

Clark Bros. Co., Olean, N. Y.

—Packing (Machine Table)

STANDARD SHOP EQUIPMENT CO., 1413 Somerset St., Philadelphia, Pa... *p. 384*

—Swage

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

Noyes & Co., H. B., Greenfield, Mass.

—Tackle

American Hoist & Derrick Co., St. Paul, Minn.

MACOMBER & WHYTE ROPE CO., Kenosha, Wis... *p. 280*

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... *p. 279*

Patterson Co., W. W., 54 Water St., Pittsburgh, Pa.

Stowell Co., South Milwaukee, Wis.

BLOOMS, STEEL

Whitaker-Glessner Co., Wheeling, W. Va.

BLOWERS

—Centrifugal

AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*

COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass... *pp. 76, 77*

DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*

Garden City Fan Co., McCormick Bldg., Chicago, Ill.

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*

*GREEN FUEL ECONOMIZER CO., 90

West St., New York... *p. 73*

Ilg. Electric Ventilating Co., 154 Whiting St., Chicago, Ill.

INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p. 456*

STERLING BLOWER CO., Hartford, Conn... *p. 436*

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

—Fan

AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*

Bicalky Fan Co., 866 Prospect Ave., Buffalo, N. Y.

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Clarae Fan Co., Kalamazoo, Mich.

Columbus Heating & Ventilating Co., Columbus, O.

COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass... *pp. 76, 77*

*GREEN FUEL ECONOMIZER CO., 90 West St., New York... *p. 73*

Ilg. Electric Ventilating Co., 154 Whiting St., Chicago, Ill.

Indiana Fan Co., 40 E. South St., Indianapolis, Ind.

Massachusetts Blower Co., Howard St., Watertown, Mass.

National Blow Pipe & Mfg. Co., 738 Dryades St., New Orleans, La.

New England Ventilating & Heating Co., Providence, R. I.

New York Blower Co., 370 Central Ave., E. Orange, N. J.

Seymour, Jr., J. M., 51-53 Lawrence St., Newark, N. J.

STERLING BLOWER CO., Hartford, Conn... *p. 436*

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*

Western Blower Co., 1800 9th Ave., South Seattle, Wash.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

—Forge

AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*

Electric Blower Co., 352 Atlantic Ave., Boston, Mass.

STERLING BLOWER CO., Hartford, Conn... *p. 436*

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

—Pressure

AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*

American Gas Furnace Co., 24 John St., New York

Buffalo Dental Mfg. Co., 587-589 Main St., Buffalo, N. Y.

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Champion Blower & Forge Co., Lancaster, Pa.

Connorsville Blower Co., Connorsville, Ind.

Crowell Mfg. Co., 296 Taaffe Place, Brooklyn, N. Y.

DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*

*GREEN FUEL ECONOMIZER CO., 90 West St., New York... *p. 73*

Kruger & Blind Co. (Lebran), 513 Master St., Philadelphia, Pa.

Nash Engineering Co., South Norwalk, Conn.

NELSON BLOWER & FURNACE CO., 11 Elkins St., Boston, Mass... *p. 67*

Piqua Blower Co., Piqua, O.

STERLING BLOWER CO., Hartford, Conn... *p. 436*

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*

Blo

See Catalogue Section for data of firms listed in capital type

BLOWERS (Continued)**—Pressure**

WILBRAHAM-GREEN BLOWER CO., Pottstown, Pa... *p. 437*

—Rotary

Beach-Russ Co., 220 Broadway, New York
Connersville Blower Co., Connersville, Ind.
Piqua Blower Co., Piqua, O.

Roots Co., P. H. & F. M., Connersville, Ind.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

WILBRAHAM-GREEN BLOWER CO., Pottstown, Pa... *p. 437*

—Soot

Bayer Steam Soot Blower Co., 2828-2840 La-Salle St., St. Louis, Mo.

Clafin & Co., Chas. A., 161 High St., Boston, Mass.

Diamond Power Specialty Co., 80 First St., Detroit, Mich.

Hafer Foundry & Machine Works, Chambersburg, Pa.

Marion Machine, Foundry & Supply Co., Marion, Ind.

Monarch Soot Remover Co., Inc., 261 Franklin St., Boston, Mass.

National Boiler Specialties Co., Elgin, Ill.

Sherwood Mfg. Co., 1702-1712 Elmwood Ave., Buffalo, N. Y.

Vulcan Soot Cleaner Co., DuBois, Pa.

—Steam Jet

AMERICAN STEAM CONVEYOR CORP'N, 326 W. Madison St., Chicago, Ill... *p. 101*

Coe Co., C. T., 10-14 Johnson St., Newark, N. J.

Eynon-Evans Mfg. Co., 15th & Clearfield Sts., Philadelphia, Pa.

*GREEN ENGINEERING CO., 13 Kennedy Ave., East Chicago, Ind... *pp. 80, 81*

McCLAVE-BROOKS CO. (McClave's), Scranton, Pa... *p. 87*

Parson Mfg. Co., 35 Nassau St., New York

Power Engineering Co., Railway Exchange, Chicago, Ill.

Sauer Power Generating Co., 5115 Rosetta St., Pittsburgh, Pa.

Schutte & Koerting Co., 12th & Thompson Sts., Philadelphia, Pa.

STERLING BLOWER CO., Hartford, Conn... *p. 436*

Vulcan Soot Cleaner Co., DuBois, Pa.

—Turbine

Coe Co., C. T., 10-14 Johnson St., Newark, N. J.

COPPUS ENGINEERING & EQUIPMENT Co., Worcester, Mass... *pp. 76, 77*

*GREEN FUEL ECONOMIZER CO., 90 West St., New York... *p. 73*

Spencer Turbine Co., Hartford, Conn.

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*

Wing Mfg. Co., L. J., 352 W. 13th St., New York

BLOWOFF PIPE PROTECTORS

Mather Co., E., 204 Walnut St., Harrisburg, Pa.

BLOWPIPES

Buffalo Dental Mfg. Co., 587-589 Main St., Buffalo, N. Y.

National Blow Pipe & Mfg. Co., 738 Dryades St., New Orleans, La.

Northern Blower Co., Cleveland, Ohio

—Blast Furnace

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p. 496*

—Cutting

Delcampe Welding Co., Bridgeport, Conn.

K-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York... *p. 419*

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J... *p. 421*

—Welding

Delcampe Welding Co., Bridgeport, Conn.

K-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York... *p. 419*

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J... *p. 421*

Oxy-Carbi Co., New Haven, Conn.
Waterhouse Welding Co., 2 Pelham St., Boston, Mass.

—Welding and Cutting

MILBURN CO., ALEXANDER, Baltimore, Md... *p. 420*

BLUE PRINTING MACHINES

Pease Co., C. F., 213-231 Institute Place, Chicago, Ill.

Wagenhorst & Co., J. H., 704 Dollar Bank Bldg., Youngstown, O.

Wickes Bros., Saginaw, Mich.

BLUEING

*AMERICAN METAL TREATMENT CO., Elizabeth, N. J... *p. 418*

BOILER ARCHES, BAFFLES, COMPOUNDS, COVERINGS, FEEDERS, FURNACES, TUBES, ETC.

(See Arches, Baffles, Compounds, Coverings, Feeders, Furnaces, Tubes, etc., Boiler)

BOILER CLEANING SYSTEMS

National Boiler Specialties Co., Elgin, Ill.

BOILER FRONTS

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind... *p. 35*

*BIGELOW CO., 76 River St., New Haven, Conn... *p. 40*

BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa... *p. 86*

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

COLE MFG. CO., R. D., Newnan, Ga... *p. 41*

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

Kelly Foundry & Machine Co., E. Purl St., Goshen, Ind.

Myerstown Foundry & Mfg. Co., Inc., 90 West St., New York

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*

VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p. 64*

WASHBURN & GRANGER, 50 Church St., New York... *p. 91*

BOILER METAL TREATMENT

Arrow Boiler Compound Co., 510 Commonwealth Trust Bldg., St. Louis, Mo.

Beltine Chemical & Mfg. Co., 401 N. Sangamon St., Chicago, Ill.

Crown Mfg. Co., Cleveland, O.

Dearborn Chemical Co., 332 S. Michigan Ave., Chicago, Ill.

Eagle Oil & Supply Co., 44-45-46 India St., Boston, Mass.

Ferrochem Co., Ltd., 30 Church St., New York

International Boiler Cleaning Co., 343 Calvert St., Baltimore, Md.

International Boiler Compound Co., 140-142 W. Austin Ave., Chicago, Ill.

Lake Erie Mfg. Co., 192 Chicago St., Buffalo, N. Y.

Mechanical Scale Prevention Co., 65 Dey St., New York

Metalene Chemical Co., Cleveland, O.

North American Chemical & Engineering Co., 23 Old Slip, New York

Paige & Jones Chemical Co., Inc., 15 E. 40th St., New York

Perolin Co. of America, 1112 W. 37th St., Chicago, Ill.

Standard Chemical Co., Kal. National Bank, Kalamazoo, Mich.

BOILER SETTINGS

Betson Plastic Fire Brick Co. (Plastic), Rome, N. Y.

Borge Incinerator Corp'n, 1216 Flatiron Bldg., New York

Blo

Crescent Refractories Co., Curwensville, Clearfield County, Pa.
Heinicke, Inc., H. R., 147 Fourth Ave., New York
KEELER CO., E., Williamsport, Pa... *p. 51*
UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*
***WICKES BOILER CO.**, Saginaw, Mich... *p. 66*
Woolson, Orasco C., 39 Cortlandt St., New York

—Steel Cased

***CASEY-HEDGES CO.**, Chattanooga, Tenn... *pp. 42, 43*
HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*
VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*
WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p. 64*
***WICKES BOILER CO.**, Saginaw, Mich... *p. 66*

BOILER SKIMMERS

Buckeye Boiler Skimmer Co., 519 Colburn St., Toledo, O.
***YARNALL-WARING CO.** (Yarway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa... *p. 139*

BOILER WASHING EQUIPMENT (Locomotive)

National Boiler Washing Co., 531 Railway Exchange, Chicago, Ill.
Rue Mfg. Co., 228 Cherry St., Philadelphia, Pa.

BOILERS**—Heating**

***CASEY-HEDGES CO.**, Chattanooga, Tenn... *pp. 42, 43*
DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*
Eclipse Fuel Engrg. Co., Rockford, Ill.
Fitzgibbons Boiler Co., E. 10th & Mercer Sts., Oswego, N. Y.
Gorton & Lidgerwood Co., 96 Liberty St., New York
Gurney Heater Mfg. Co., 188-200 Franklin St., Boston, Mass.
***HEINE SAFETY BOILER CO.**, St. Louis, Mo... *p. 50*
Herbert Boiler Co., Root & LaSalle Sts., Chicago, Ill.
Hitchings & Co., Elizabeth, N. J.
HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*
Hudson Boiler Mfg. Co., 359 W. 42nd St., New York
Ideal Heating Co., 915 Gates Ave., Brooklyn, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
KEELER CO., E., Williamsport, Pa... *p. 51*
Kewanee Boiler Co. (Kewanee), Kewanee, Ill.
KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill... *p. 56*
Lord & Burnham Co., 2 Main St., Irvington-on-Hudson, N. Y.
Macbeth Boiler Co., 1240 W. 4th St., Cleveland, O.
Molby Boiler Co., Inc., 101 Park Ave., New York
MURRAY IRON WORKS CO., Burlington, Ia... *pp. 54, 55*
Nagle Engine & Boiler Works, Erie, Pa.
OIL CITY BOILER WORKS, Oil City, Pa... *p. 58*
PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*
Pierce, Butler & Pierce Mfg. Corp'n, 431 E. 162nd St., New York
Richardson & Boynton Co., 31 W. 31st St., New York
Royal Steam Heater Co., Gardner, Mass.
***SMITH CO.**, H. B., Westfield, Mass... *pp. 478, 479*
UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*
United States Radiator Corp'n (Capitol), Detroit, Mich.

—High Pressure

ALMY WATER TUBE BOILER CO., Providence, R. I... *p. 34*
***BABCOCK & WILCOX CO.**, 85 Liberty St., New York... *pp. 36, 37, 38, 39*
Badenhausen Co., 1425 Chestnut St., Philadelphia, Pa.
***BIGELOW CO.**, 76 River St., New Haven, Conn... *p. 40*
***CASEY-HEDGES CO.**, Chattanooga, Tenn... *pp. 42, 43*
COLE MFG CO., R. D., Newnan, Ga... *p. 41*
DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*
***EDGE MOOR IRON CO.**, Edge Moor, Del... *p. 46*
Fitzgibbons Boiler Co., E. 10th & Mercer Sts., Oswego, N. Y.
Godfrey, Keeler Co., 70 Warren St., New York
***HEINE SAFETY BOILER CO.**, St. Louis, Mo... *p. 50*
HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*
Inglis Co., Ltd., Toronto, Ont., Canada
KEELER CO., E., Williamsport, Pa... *p. 51*
KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill... *p. 56*
LADD CO., GEORGE T., 1620 Farmers Bank Bldg., Pittsburgh, Pa... *pp. 52, 53*
Lord & Burnham Co., 2 Main St., Irvington-on-Hudson, N. Y.
MURRAY IRON WORKS CO., Burlington, Ia... *pp. 54, 55*
OIL CITY BOILER WORKS, Oil City, Pa... *p. 58*
PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*
Smith & Son Co., Samuel, 130-150 Railroad Ave., Paterson, N. J.
UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*
UNION IRON WORKS (Union), Erie, Pa... *p. 61*
WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p. 64*
***WICKES BOILER CO.**, Saginaw, Mich... *p. 66*
Winslow Safety High Pressure Boiler Co., 4600 W. Harrison St., Chicago, Ill.

—Internal Furnace

***BIGELOW CO.**, 76 River St., New Haven, Conn... *p. 40*
***CASEY-HEDGES CO.**, Chattanooga, Tenn... *pp. 42, 43*
DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*
Freeman & Sons Mfg. Co., S., Racine, Wis.
Godfrey, Keeler Co., 70 Warren St., New York
Granger Co., A. D., 15 Park Row, New York
International Engineering Works, Inc., Framingham, Mass.
Kingsford Foundry & Machine Works, Oswego, N. Y.
La Crosse Boiler Co., La Crosse, Wis.
***LEFFEL & CO.**, JAMES, Springfield, O... *p. 453*
Mack Bros. Boiler & Sheet Iron Works, Syracuse, N. Y.
MURRAY IRON WORKS CO., Burlington, Ia... *pp. 54, 55*
OIL CITY BOILER WORKS, Oil City, Pa... *p. 58*
PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*
Reliance Boiler Works, 160 Marion St., Oshkosh, Wis.
***SPRINGFIELD BOILER CO.**, Springfield, Ill... *p. 60*

—Locomotive

***BIGELOW CO.**, 76 River St., New Haven, Conn... *p. 40*
DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*
FROST MFG. CO., 112 W. Adams St., Chicago, Ill... *pp. 47, 462*
Godfrey, Keeler Co., 70 Warren St., New York

Boi

BOILERS (Continued)**—Locomotive**

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

International Boiler Works Co., East Stroudsburg, Pa.

Manitowoc Boiler Works Co., Manitowoc, Wis.
MURRAY IRON WORKS CO., Burlington, Ia... *pp. 54, 55*

Nagle Engine & Boiler Works, Erie, Pa.
OIL CITY BOILER WORKS, Oil City, Pa... *p. 58*

Orr & Sembower, Reading, Pa.
PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

Smith & Son Co., Samuel, 130-150 Railroad Ave., Paterson, N. J.

Wood, William H., Media, Pa.

—Marine

ALMY WATER TUBE BOILER CO., Providence, R. I... *p. 34*

American Condenser & Engineering Corp'n, 120 Broadway, New York

*BACOCK & WILCOX CO., 85 Liberty St., New York... *pp. 36, 37, 38, 39*

Babcock & Wilcox, Ltd., College St., St. Henry, Montreal, Canada

Bath Iron Works, Ltd., Bath, Me.

*BIGELOW CO., 76 River St., New Haven, Conn... *p. 40*

Boston Engineering Co., India Wharf, Boston, Mass.

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

Connelly Boiler Co., D., Ivanhoe Road, Cleveland, O.

Delany & Co., P., Newburgh, N. Y.

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*

Dominion Bridge Co., Ltd., Montreal, P. Q., Canada

*EDGE MOOR IRON CO., Edge Moor, Del... *p. 46*

Fitzgibbons Boiler Co., E. 10th & Mercer Sts., Oswego, N. Y.

Gas Engine & Power Co., & Charles L. Seabury & Co., Cons., Morris Heights, New York

*HEINE SAFETY BOILER CO., St. Louis, Mo... *p. 50*

Hodge Boiler Works, 99 Sumner St., East Boston, Mass.

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

International Boiler Works Co., East Stroudsburg, Pa.

KEELER CO., E., Williamsport, Pa... *p. 51*

Kingsford Foundry & Machine Works, Oswego, N. Y.

La Crosse Boiler Co., La Crosse, Wis.

Manitowoc Boiler Works Co., Manitowoc, Wis.

MURRAY IRON WORKS CO., Burlington, Ia... *pp. 54, 55*

NEW YORK ENGINEERING CO., 2 Rector St., New York... *p. 57*

Nichols Iron Works, Inc., D. M., 2-4 Governor Slip, New York

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

Rees & Sons Co., James, Pittsburgh, Pa.

Roberts Safety Water Tube Boiler Co., 39-41 Cortlandt St., New York

*SPRINGFIELD BOILER CO., Springfield, Ill... *p. 60*

Valk & Murdoch Co., Charleston, S. C.

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p. 64*

WARD ENGINEERING WORKS, CHARLES, Charleston, W. Va... *p. 65*

*WICKES BOILER CO., Saginaw, Mich... *p. 66*

—Oil Burning

ALMY WATER TUBE BOILER CO., Providence, R. I... *p. 34*

*BIGELOW CO., 76 River St., New Haven, Conn... *p. 40*

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

Roberts Safety Water Tube Boiler Co., 39-41 Cortlandt St., New York

—Portable

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

*CLYDE IRON WORKS, 29th Ave., W. & Michigan St., Duluth, Minn... *p. 268*

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*

Farrar & Trefits, Inc., Perry & Illinois Sts., Buffalo, N. Y.

Godfrey, Keeler Co., 70 Warren St., New York

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

KEELER CO., E., Williamsport, Pa... *p. 51*

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill... *p. 56*

*LEFFEL & CO., JAMES, Springfield, O... *p. 453*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

Nagle Engine & Boiler Works, Erie, Pa.

National Supply Co., 138 Huron St., Toledo, O.

OIL CITY BOILER WORKS, Oil City, Pa... *p. 58*

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p. 64*

—Return Tubular

Ames Iron Works, Oswego, N. Y.

Baker Iron Works, 950 N. Broadway, Los Angeles, Cal.

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind... *p. 35*

*BIGELOW CO. (Bigelow), 76 River St., New Haven, Conn... *p. 40*

Brownell Co., Dayton, O.

BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa... *p. 86*

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

Chandler & Taylor Co., Indianapolis, Ind.

Coatesville Boiler Works, 30 Church St., New York

COLE MFG. CO., R. D., Newnan, Ga... *p. 41*

Connelly Boiler Co., D., Ivanhoe Road, Cleveland, O.

Delany & Co., P., Newburgh, N. Y.

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*

Dutton Co., C. H., Kalamazoo, Mich.

Enterprise Boiler Co., Youngstown, O.

Erie City Iron Works, Erie, Pa.

Farquhar Co., Ltd., A. B., York, Pa.

Farrar & Trefits, Inc., Perry & Illinois Sts., Buffalo, N. Y.

Freeman & Sons Mfg. Co., S., Racine, Wis.

FROST MFG. CO., 112 W. Adams St., Chicago, Ill... *pp. 47, 462*

Godfrey, Keeler Co., 70 Warren St., New York

Griffith & Wedge Co., Zanesville, O.

Herbert Boiler Co., Root & La Salle Sts., Chicago, Ill.

Hodge Boiler Works, 99 Sumner St., East Boston, Mass.

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

International Engineering Works, Inc., Framingham, Mass.

KEELER CO., E., Williamsport, Pa... *p. 51*

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill... *p. 56*

La Crosse Boiler Co., La Crosse, Wis.

Leslie & Elliott Co., Cor. E. Railway & Iowa Ave., Paterson, N. J.

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

Lombard Iron Works & Supply Co., Augusta, Ga.

Lookout Boiler & Mfg. Co., Chattanooga, Tenn.

Lucey Mfg. Corp'n, Woolworth Bldg., New York

Advertisements of firms marked * appear in The Journal, A. S. M. E.

McDermott Engineering Co., Whitehall & Jordan Sts., Allentown, Pa.
McEwen Brothers, Wellsville, N. Y.
Machold & Riddell, 1020 Stephen Girard Bldg., Philadelphia, Pa.
Mack Bros. Boiler & Sheet Iron Works, Syracuse, N. Y.

Michelmann Steel Construction Co., 121-141 N. Second St., Quincy, Ill.
Milwaukee Boiler Co., 220 Oregon St., Milwaukee, Wis.

Murphy Iron Works, John H., New Orleans, La.

MURRAY IRON WORKS CO., Burlington, Ia...*pp. 54, 55*

Muskegon Boiler Works, Muskegon, Mich.

Nagle Engine & Boiler Works, Erie, Pa.

O'Brien Boiler Works Co., John, St. Louis, Mo.

OIL CITY BOILER WORKS, Oil City, Pa...*p. 58*

PHOENIX IRON WORKS CO., Meadville, Pa...*p. 497*

Randle Machinery Co., Cincinnati, O.

Ruemmel-Dawley Mfg. Co., 3900 Choteau Ave., St. Louis, Mo.

Schofield's Sons Co., J. S., Macon, Ga.

Smith & Son Co., Samuel, 130-150 Railroad Ave., Paterson, N. J.

Southern Engine & Boiler Works, Jackson, Tenn.

Star Boiler Works, Clinton, Ia.

Stewart Boiler Works, Albany St., Worcester, Mass.

UNIFLOW BOILER CO., INC., Philadelphia, Pa...*p. 62*

VOGT MACHINE CO., HENRY, Louisville, Ky...*p. 63*

WALSH & WEIDNER CO., Chattanooga, Tenn...*p. 64*

Walton & Son, C. J., 1221 W. Main St., Louisville, Ky.

Wholey Boiler Works, Providence, R. I.

*WICKES BOILER CO., Saginaw, Mich...*p. 66*

Wilson Machine Co., W. A., 217 N. Water St., Rochester, N. Y.

Wm. Bros. Boiler & Mfg. Co., Minneapolis, Minn.

—Vertical Tubular

*BIGELOW CO. (Bigelow-Manning), 76 River St., New Haven, Conn...*p. 40*

*CASEY-HEDGES CO., Chattanooga, Tenn...*pp. 42, 43*

COLE MFG. CO., R. D., Newnan, Ga...*p. 41*

Delany & Co., P., Newburgh, N. Y.

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass...*pp. 44, 45*

Dutton Co., C. H., Kalamazoo, Mich.

FROST MFG. CO., 112 W. Adams St., Chicago, Ill...*pp. 47, 462*

Godfrey, Keeler Co., 70 Warren St., New York

International Boiler Works Co., East Stroudsburg, Pa.

International Engineering Works, Inc., Framingham, Mass.

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill...*p. 56*

*LEFFEL & CO., JAMES, Springfield, O...*p. 453*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York...*p. 271*

MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis...*p. 112*

MURRAY IRON WORKS CO., Burlington, Ia...*pp. 54, 55*

Nagle Engine & Boiler Works, Erie, Pa.

OIL CITY BOILER WORKS, Oil City, Pa...*p. 58*

PHOENIX IRON WORKS CO., Meadville, Pa...*p. 497*

Smith & Son Co., Samuel, 130-150 Railroad Ave., Paterson, N. J.

Stewart Boiler Works, Albany St., Worcester, Mass.

VOGT MACHINE CO., HENRY, Louisville, Ky...*p. 63*

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn...*p. 64*

—Water Tube

Abendroth & Root Mfg. Co., 45 Broadway, New York

ALMY WATER TUBE BOILER CO., Providence, R. I...*p. 34*

American Condenser & Engineering Corp'n, 120 Broadway, New York

*BABCOCK & WILCOX CO., 85 Liberty St., New York...*pp. 36, 37, 38, 39*

Babcock & Wilcox, Ltd., College St., St. Henry, Montreal, Canada

Badenhausen Co., 1425 Chestnut St., Philadelphia, Pa.

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind...*p. 35*

*BIGELOW CO. (Bigelow-Hornaby), 76 River St., New Haven, Conn...*p. 40*

Brennan & Co., John, 24th St. & M. C. R. R., Detroit, Mich.

*CASEY-HEDGES CO., Chattanooga, Tenn...*pp. 42, 43*

Connelly Boiler Co., D., Ivanhoe Road, Cleveland, O.

Cunningham Co., Christopher, 894 Greenpoint Ave. & Newton Creek, Brooklyn, N. Y.

De Pere Mfg. Co., 122 S. Michigan Ave., Chicago, Ill.

*EDGE MOOR IRON CO., Edge Moor, Del...*p. 46*

Erie City Iron Works, Erie, Pa.

Flanner Boiler Co., Akron, O.

Freeman & Sons Mfg. Co., S., Racine, Wis.

Gas Engine & Power Co., and Charles L. Seabury & Co., Cons., Morris Heights, New York

Goldie & McCulloch Co., Ltd., Galt, Ont., Canada

Granger Co., A. D., 15 Park Row, New York

*HEINE SAFETY BOILER CO., St. Louis, Mo...*p. 50*

KEELER CO., E., Williamsport, Pa...*p. 51*

Kingsford Foundry & Machine Works, Oswego, N. Y.

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill...*p. 56*

LADD CO., GEORGE T., 1620 Farmers Bank Bldg., Pittsburgh, Pa...*pp. 52, 53*

Lebanon Boiler Works, Lebanon, Pa.

Llewellyn Iron Works, Los Angeles, Cal.

McNaull Boiler Mfg. Co., Toledo, O.

Manitowoc Boiler Works Co., Manitowoc, Wis.

MURRAY IRON WORKS CO., Burlington, Ia...*pp. 54, 55*

Nagle Engine & Boiler Works, Erie, Pa.

NEW YORK ENGINEERING CO., 2 Rector St., New York...*p. 57*

O'Brien Boiler Works Co., John, St. Louis, Mo.

OIL CITY BOILER WORKS, Oil City, Pa...*p. 58*

Olmstead & Sons, A. E., Pulaski, N. Y.

PAGE BOILER CO., 815-819 Larrabee St., Chicago, Ill...*p. 59*

Pennsylvania Boiler Works, 12th & Penna. Ave., Erie, Pa.

Prospect Boiler Co., Codurse Ave. & Power St., New Brunswick, N. J.

Robb Engineering Works, Ltd., Amherst, N. S., Canada

Roberts Safety Water Tube Boiler Co., 39-41 Cortlandt St., New York

*SMITH CO., H. B., Westfield, Mass...*pp. 478, 479*

*SPRINGFIELD BOILER CO., Springfield, Ill...*p. 60*

Stirling, Allan, 878 Drexel Bldg., Philadelphia, Pa.

UNION IRON WORKS (Union), Erie, Pa...*p. 61*

VOGT MACHINE CO., HENRY, Louisville, Ky...*p. 63*

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn...*p. 64*

WARD ENGINEERING WORKS, CHARLES, Charleston, W. Va...*p. 65*

Washington Iron Works, 1100 Seattle Boulevard, Seattle, Wash.

Boi

BOILERS (Continued)**—Water Tube**

*WICKES BOILER CO., Saginaw, Mich...
p. 66
Winslow Safety High Pressure Boiler Co., 4600
W. Harrison Co., Chicago, Ill.

BOILERS RETUBED

Connery & Co., Inc., 2nd & Luzerne Sts., Phila-
delphia, Pa.
DILLON STEAM BOILER WORKS, D. M.,
Pittsburg, Mass... pp. 44, 45
Granger Co., A. D., 15 Park Row, New York
KROESCHELL BROS. CO., 460 West Erie
St., Chicago, Ill... p. 56
UNIFLOW BOILER CO., INC., Philadelphia,
Pa... p. 62
Wendland Engineering & Construction Co., C.
F., 63 Worcester St., New York

BOLT AND NUT MACHINERY

Acme Machinery Co., Cleveland, O.
Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, O.
Brown Co., H. B., East Hampton, Conn.
Kent Machine Co., Kent, O.
LANDIS MACHINE CO., INC., Waynesboro,
Pa... pp. 372, 373
National Machinery Co., Tiffin, O.
NILES-BEMENT-POND CO., 111 Broadway,
New York... p. 344
Pawtucket Mfg. Co., 327 Price St., Pawtucket,
R. I.
WEBSTER & PERKS TOOL CO., 300 Center
St., Springfield, O... p. 365
WILLIAMS, WHITE & CO., Moline, Ill...
p. 314

BOLT CUTTERS, HEADERS, ETC.

(See Cutters, Headers, etc., Bolt)

BOLTS

Bayonne Bolt & Nut Co., Bayonne, N. J.
Bethlehem Steel Co., South Bethlehem, Pa.
Clark Bros. Bolt Co., Milldale, Conn.
COLUMBUS BOLT WORKS CO., Columbus,
O... p. 405
Hall's Sons, Samuel, 229 W. 10th St., New York
Hartford Machine Screw Co., Hartford, Conn.
Lamson & Sessions Co., Cleveland, O.
Michigan Bolt & Nut Works, Detroit, Mich.
Pittsburgh Screw & Bolt Co., Preble Ave.,
Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
Standard Bolt Co., Columbus, O.
Tock Screw Machine Products Corp'n, 190 Eighth
St., Long Island City, N. Y.
Upson Nut Co., Scranton Rd., Cleveland, O.

—Brass and Bronze

CINCINNATI SCREW CO., Twightwee, O.
(Cincinnati Suburb)... p. 402
CORBIN SCREW CORP'N, New Britain,
Conn... p. 403

Pawtucket Mfg. Co., 327 Price St., Pawtucket,
R. I.

St. Louis Screw Co., St. Louis, Mo.
Standard Screw Products Co., Bellevue & Warren
Aves., Detroit, Mich.

—Carriage

RUSSELL, BURDSALL & WARD BOLT &
NUT CO. (Empire), Port Chester, N. Y... p. 407

—Expansion

Brohard Co., 3rd St. & Lehigh Ave., Philadelphia,
Pa.

Church, Isaac, 1 Fourth St., East Norwalk, Conn.
DIAMOND EXPANSION BOLT CO., 90
West St., Cor. Cedar, New York... p. 409
Estate F. H. Evans, 31-35 Hewes St., Brooklyn,
N. Y.

National Lead Co., 111 Broadway, New York
NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273

NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... p. 279

Star Expansion Bolt Co., 147-149 Cedar St.,
New York

Steward & Romaine Mfg. Co., 124 N. 6th St.,
Philadelphia, Pa.

—Eye

Brohard Co., 3rd St. & Lehigh Ave., Phila-
delphia, Pa.

NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... p. 279

Page-Storms Drop Forge Co., Chicopee, Mass.
WILLIAMS & CO., J. H., 70 Richards St.,
Brooklyn, N. Y... p. 397

—Machine

CINCINNATI SCREW CO., Twightwee, O.
(Cincinnati Suburb)... p. 402

Clark Bros. Bolt Co., Milldale, Conn.
COLUMBUS BOLT WORKS CO., Columbus,
O... p. 405

CORBIN SCREW CORP'N, New Britain,
Conn... p. 403

Hall's Sons, Samuel, 229 W. 10th St., New York
Ohio Nut & Bolt Co., Berea, O.

Oliver Iron & Steel Co., Pittsburgh, Pa.
Pawtucket Mfg. Co., 327 Price St., Pawtucket,
R. I.

Rhode Island Tool Co., 148 West River St.,
Providence, R. I.

RUSSELL, BURDSALL & WARD BOLT &
NUT CO. (Empire), Port Chester, N. Y... p.
407

St. Louis Screw Co., St. Louis, Mo.

—Machine Table

STANDARD SHOP EQUIPMENT CO., 1413
Somerset St., Philadelphia, Pa... p. 384

—Patch

RUSSELL, BURDSALL & WARD BOLT &
NUT CO. (Empire), Port Chester, N. Y... p.
407

—Spring

Bowen Products Corp'n, Auburn, N. Y.

Brown Co., Syracuse, N. Y.

Postoria Screw Co., Postoria, O.

Michigan Screw Co., Lansing, Mich.

RUSSELL, BURDSALL & WARD BOLT &
NUT CO. (Empire), Port Chester, N. Y... p.
407

Steel Products Co., Cleveland, O.

—Stove

AMERICAN SCREW CO., Providence, R. I...
pp. 400, 401

COLUMBUS BOLT WORKS CO., Columbus,
O... p. 405

CORBIN SCREW CORP'N, New Britain,
Conn... p. 403

Falls River Co., Kent, O.

Ohio Nut & Bolt Co., Berea, O.

Reading Screw Co., Norristown, Pa.

RUSSELL, BURDSALL & WARD BOLT &
NUT CO. (Empire), Port Chester, N. Y... p.
407

—Stud

BLAKE & JOHNSON CO., Waterbury, Conn...
p. 482

CINCINNATI SCREW CO., Twightwee, O.
(Cincinnati Suburb)... p. 402

Cleveland Wrought Products Co., Cleveland, O.
CORBIN SCREW CORP'N, New Britain,
Conn... p. 403

Niagara Screw Co., 20 Lock St., Buffalo, N. Y.

RUSSELL, BURDSALL & WARD BOLT &
NUT CO. (Empire), Port Chester, N. Y... p.
407

—Tap

CORBIN SCREW CORP'N, New Britain,
Conn... p. 403

RUSSELL, BURDSALL & WARD BOLT &
NUT CO. (Empire), Port Chester, N. Y... p.
407

—Tire

AMERICAN SCREW CO., Providence, R. I...
pp. 400, 401

CINCINNATI SCREW CO., Twightwee, O.
(Cincinnati Suburb)... p. 402

CORBIN SCREW CORP'N, New Britain, Conn...
p. 403

Reading Screw Co., Norristown, Pa.

Boi

RUSSELL, BURDSALL & WARD BOLT & NUT CO. (Empire), Port Chester, N. Y. . . *p.* 407

—**Toggle**

Church, Isaac, 1 Fourth St., East Norwalk, Conn.
DIAMOND EXPANSION BOLT CO., 90 West St., Cor. Cedar, New York. . . *p.* 409

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York. . . *p.* 279

Star Expansion Bolt Co., 147-149 Cedar St., New York

—**Track**

National Bolt & Nut Co., 62nd St. & A. V. R. R., Pittsburgh, Pa.

BOOK-BINDERS' MACHINERY

Sigourney Tool Co., 9 Sigourney St., Hartford, Conn.

Southworth Machine Co., Portland, Me.

BOOSTERS, GAS

Connersville Blower Co., Connersville, Ind.

HOPE ENGINEERING & SUPPLY CO., Mt. Vernon, O. . . *p.* 32

INGERSOLL-RAND CO., 11 Broadway, New York. . . *pp.* 428, 429

BORING AND DRILLING MACHINES

Defiance Machine Works, Defiance, O.

GIDDINGS & LEWIS MFG. CO., Fond du Lac, Wis. . . *p.* 342

Gisholt Machine Co., Madison, Wis.

Milwaukee Electric Crane & Mfg. Co., Milwaukee, Wis.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . *p.* 344

Pawling & Harnischfeger, Milwaukee, Wis.

Pedrick Tool & Machine Co., 3642 N. Lawrence St., Philadelphia, Pa.

Stecher Co., Charles, 1578 Crossing St., Chicago, Ill.

UNIVERSAL BORING MACHINE CO., Hudson, Mass. . . *p.* 343

BORING AND TURNING MILLS, VERTICAL

Betts Machine Co., Rochester, N. Y.

Bickford & Co., H., Lakeport, N. H.

BULLARD MACHINE TOOL CO., Bridgeport, Conn. . . *p.* 537

CINCINNATI PLANNER CO., Oakley, Cincinnati, O. . . *pp.* 338, 339

COLBURN MACHINE TOOL CO., Franklin, Pa. . . *pp.* 340, 341

Gisholt Machine Co., Madison, Wis.

King Machine Tool Co., Winton Place Station, Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . *p.* 344

BORING, DRILLING AND MILLING MACHINES (Horizontal Combined)

GIDDINGS & LEWIS MFG. CO., Fond du Lac, Wis. . . *p.* 342

Lucas Machine Tool Co., Cleveland, O.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . *p.* 344

UNIVERSAL BORING MACHINE CO., Hudson, Mass. . . *p.* 343

BORING MACHINES

—**Cylinder**

Barrett Machine Tool Co., Meadville, Pa.

Beaman & Smith Co., Providence, R. I.

Foote-Burt Co., Cleveland, O.

Hartford Engine Works, 223 State St., Hartford, Conn.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . *p.* 344

Rookaby & Co., E. J., 435 N. Eleventh St., Philadelphia, Pa.

Stow Flexible Shaft Co., 26th & Callowhill Sts., Philadelphia, Pa.

—**Cylinder (Locomotive)**
Barrett Machine Tool Co., Meadville, Pa.

—**Horizontal**

Barrett Machine Tool Co., Meadville, Pa.

Cleveland Machine Tool Co., 3213 Superior Ave., Cleveland, O.

Espen-Lucas Machine Works, Front & Girard Aves., Philadelphia, Pa.

—**Multiple Spindle**

Barrett Machine Tool Co., Meadville, Pa.

Greenlee Bros. & Co., Rockford, Ill.

Moline Tool Co., Moline, Ill.

NATIONAL AUTOMATIC TOOL CO., Richmond, Ind. . . *p.* 346

NILES-BEMENT-POND CO., 111 Broadway, New York. . . *p.* 344

—**Vertical**

Baker Brothers, Toledo, O.

BULLARD MACHINE TOOL CO., Bridgeport, Conn. . . *p.* 537

NILES-BEMENT-POND CO., 111 Broadway, New York. . . *p.* 344

BORING TOOLS

(See Tools, Boring)

BOTTLE BLOWING MACHINERY

Lynch Glass Machinery Co., Anderson, Ind.

BOTTLE MOLD CUTTING MACHINES

KELLER MECHANICAL ENGRAVING CO., 68 Washington St., Brooklyn, N. Y. . . *p.* 369

BOTTLE WASHING MACHINERY

Rice & Adams Corp'n., Buffalo, N. Y.

BOTTLING MACHINERY

Loew Mfg. Co., 9001 Madison Ave., N. W., Cleveland, O.

***VILTER MFG. CO.**, 1194-1196 Clinton St., Milwaukee, Wis. . . *p.* 18

BOX MACHINERY

—**Paper**

Griswold Machine Co., Geo. M., New Haven, Conn.

Jagenberg Machine Co., Inc., 131 W. 24th St., New York

Knowlton Co., M. D., 29 Elizabeth St., Rochester, N. Y.

Mereen Johnson Machine Co., Minneapolis, Minn.

Robinson Co., John T., Hyde Park Sta., Boston, Mass.

Staudt Mfg. Co., E. G., 2675 University Ave., St. Paul, Minn.

Stecher Co., Charles, 1578 Crossing St., Chicago, Ill.

Stokes & Smith Co., Summerdale, Philadelphia, Pa.

—**Wood**

Cobden Machine Works, Cobden, Ill.

Chase Turbine Mfg. Co., Orange, Mass.

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p.* 194

Knowlton Co., M. D., 29 Elizabeth St., Rochester, N. Y.

Luster-Jordan Co., Inc., W. Washington St., Norristown, Pa.

BOXES

—**Annealing and Carbonising**

BLAW-KNOX CO. (Knox), Pittsburgh, Pa. . . *p.* 489

Garwood Bronze & Iron Works, Garwood, N. J.

MALLEABLE IRON FITTINGS CO., Branford, Conn. . . *p.* 157

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. . . *p.* 496

—**Case Hardening**

Driver-Harris Co., Harrison, N. J.

—**Fibre**

AMERICAN VULCANIZED FIBRE CO., Wilmington, Del. . . *p.* 296

***DIAMOND STATE FIBRE CO.**, Bridgeport, Pa. . . *p.* 298

—**Fuse**

D & W FUSE CO., Providence, R. I. . . *p.* 393

***GENERAL ELECTRIC CO.**, Schenectady, N. Y. . . *pp.* 20, 21, 521

—**Metal**

Cleveland Wire Spring Co., Cleveland, O.

—**Tool**

Cleveland Wire Spring Co., Cleveland, O.

Box

BOXES (Continued)**—Tool**

Globe Machine & Stamping Co., 1254 W. 76th St., N. W., Cleveland, O.

—Tote

NEW BRITAIN MACHINE CO., New Britain, Conn... *p.* 336

BRACES, BOILER

LUKENS STEEL CO., Coatesville, Pa... *p.* 69

RYERSON & SON, JOSEPH T., 16th & Rockwell Sts., Chicago, Ill... *p.* 366

Scully Steel & Iron Co., P. O. Box 814, Chicago, Ill.

BRADING MACHINES

NEW ENGLAND BUTT CO., Providence, R. I... *p.* 484

TEXTILE MACHINE WORKS, Reading, Pa... *p.* 485

—Hose

TEXTILE MACHINE WORKS, Reading, Pa... *p.* 485

BRADING WHEELS

Peninsular Emery Wheel Co., 253 Meldrum Ave., Detroit, Mich.

BRAKE BLOCKS

*JOHNS-MANVILLE CO., H. W., 1206 Madison Ave., New York... *p.* 102

Thermoid Rubber Co., Trenton, N. J.

BRAKE DRUMS (Pressed Steel)

WORCESTER PRESSED STEEL CO., Worcester, Mass... *p.* 305

BRAKES**—Air**

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp.* 20, 21, 521

Westinghouse Air Brake Co., Wilmerding, Pa.

WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa... *pp.* 432, 433

—Electric

Electric Controller & Mfg. Co., Cleveland, O.

BRASS AND COPPER (Roll Sheet)

AMERICAN BRASS CO., Waterbury, Conn... *p.* 295

Chase Rolling Mill Co., Waterbury, Conn.

Rutter & Co., Arthur T., 256 Broadway, New York

Taunton-New Bedford Copper Co., Taunton, Mass.

Winchester Repeating Arms Co., New Haven, Conn.

BRASS GOODS

American Lubricator Co., Detroit, Mich.

Bartlett Hayward Co., Baltimore, Md.

Bridgeport Brass Co., Bridgeport, Conn.

BUCKEYE IRON & BRASS WORKS, Dayton, O... *p.* 481

Cleveland Brass Mfg. Co., 4606 Hamilton Ave., Cleveland, O.

Commonwealth Brass Corp'n, Commonwealth Ave. & Grand Trunk Ry., Detroit, Mich.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

Detroit Brass Works, 99 Hobart Ave., Detroit, Mich.

Grand Rapids Brass Co., 90 Scribner Ave., N. W., Grand Rapids, Mich.

*GREENE, TWEED & CO., 109 Duane St., New York... *p.* 168

KELLY & JONES CO., Greensburg, Pa... *pp.* 130, 131

MORRISON BROS., Dubuque, Ia... *p.* 495

Mueller Mfg. Co., H. Decatur, Ill.

Pittsburgh Brass Mfg. Co., Penn. Ave. & 32nd St., Pittsburgh, Pa.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp.* 170, 171

Ridgdon Tool & Machine Co., Andrew Ave., Naugatuck, Conn.

Rutter & Co., Arthur T., 256 Broadway, New York

Scovill Mfg. Co., Waterbury, Conn.

Smith Mfg. Co., A. P., East Orange, N. J.

Sterling Specialty Co., Newcomerstown, O.

BRASS MILL MACHINERY

*POOLE ENGINEERING & MACHINE CO.,

Woodbury, Baltimore, Md... *pp.* 196, 197

TORRINGTON MFG. CO., Torrington, Conn... *p.* 483

FARNHAM MFG. CO., 31-39 Indiana St., Buffalo, N. Y... *p.* 277

BRASS WORKS (Ornamental)

(See Ornamental Work)

BRASS WORKING MACHINERY

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p.* 490

*WARNER & SWASEY CO., Cleveland, O... *pp.* 328, 329

BRAZING

American Tube Bending Co., New Haven, Conn.

MORRISON BROS., Dubuque, Ia... *p.* 495

BREECHINGS, SMOKE

Abendroth Co., G. Irving, 10 E. 43rd St., New York

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind... *p.* 35

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp.* 42, 43

Connery & Co., Inc., 2nd & Luzerne Sts., Philadelphia, Pa.

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp.* 44, 45

*HEINE SAFETY BOILER CO., St. Louis, Mo... *p.* 50

KEELER CO., E. Williamsport, Pa... *p.* 51

PHOENIX IRON WORKS CO., Meadville, Pa... *p.* 497

Pickham Boiler Co., 3035 W. Jackson Blvd., Chicago, Ill.

Turl Iron & Car Co., Inc., 50 Broad St., New York

UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p.* 62

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p.* 64

WASHBURN & GRANGER, 50 Church St., New York... *p.* 91

BREWERS MACHINERY

PFAUDLER CO., Rochester, N. Y... *p.* 499

*VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis... *p.* 18

BRICK**—Acid Proof**

Harbison-Walker Refractories Co., Farmers' Bank Bldg., Pittsburgh, Pa.

—Arch (Locomotive)

American Arch Co., McCormick Bldg., Chicago, Ill.

—Blast Furnace

Ashland Fire Brick Co., Ashland, Ky.

—Carborundum

Didier-March Co., P. O. Box 327, Perth Amboy, N. J.

STERLING GRINDING WHEEL CO., Tiffin, O... *p.* 392

—Enameled

American Enameled Brick & Tile Co., 52 Vanderbilt Ave., New York

—Fire

American Enameled Brick & Tile Co., 52 Vanderbilt Ave., New York

Ashland Fire Brick Co., Ashland, Ky.

Betson Plastic Fire Brick Co. (Plastic), Rome, N. Y.

*DETRICK CO., M. H., 549 W. Washington St., Chicago, Ill... *p.* 97

Didier-March Co., P. O. Box 327, Perth Amboy, N. J.

Dover Fire Brick Co., 509 Cuyahoga Bldg., Cleveland, O.

Evans & Howard Fire Brick Co., 920 Market St., St. Louis, Mo.

Gardner, Jr. Co., James, Ebensburg, Pa.

Box

Electric Controller & Mfg. Co., Cleveland, O.

BRASS AND COPPER (Roll Sheet)

AMERICAN BRASS CO., Waterbury, Conn... *p.* 295

Chase Rolling Mill Co., Waterbury, Conn.

Rutter & Co., Arthur T., 256 Broadway, New York

Taunton-New Bedford Copper Co., Taunton, Mass.

Winchester Repeating Arms Co., New Haven, Conn.

BRASS GOODS

American Lubricator Co., Detroit, Mich.

Bartlett Hayward Co., Baltimore, Md.

Bridgeport Brass Co., Bridgeport, Conn.

BUCKEYE IRON & BRASS WORKS, Dayton, O... *p.* 481

Cleveland Brass Mfg. Co., 4606 Hamilton Ave., Cleveland, O.

Commonwealth Brass Corp'n, Commonwealth Ave. & Grand Trunk Ry., Detroit, Mich.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

Detroit Brass Works, 99 Hobart Ave., Detroit, Mich.

Grand Rapids Brass Co., 90 Scribner Ave., N. W., Grand Rapids, Mich.

*GREENE, TWEED & CO., 109 Duane St., New York... *p.* 168

KELLY & JONES CO., Greensburg, Pa... *pp.* 130, 131

MORRISON BROS., Dubuque, Ia... *p.* 495

Mueller Mfg. Co., H. Decatur, Ill.

Pittsburgh Brass Mfg. Co., Penn. Ave. & 32nd St., Pittsburgh, Pa.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp.* 170, 171

Ridgdon Tool & Machine Co., Andrew Ave., Naugatuck, Conn.

Rutter & Co., Arthur T., 256 Broadway, New York

Scovill Mfg. Co., Waterbury, Conn.

Smith Mfg. Co., A. P., East Orange, N. J.

Advertisements of firms marked * appear in The Journal, A. S. M. E.

Harbison-Walker Refractories Co., Farmers' Bank Bldg., Pittsburgh, Pa.
 Kentucky Southern Refractories Co., Fort Payne, Ala.
 Kier Fire Brick Co., 2243 Oliver Bldg., Pittsburgh, Pa.
 Maurer & Son, Henry, 420 E. 23rd St., New York

Pyro Clay Products Co., Oak Hill, Ohio
 Taylor Sons Co., Charles, Cincinnati, O.
 Wagner Fire Brick Co., Inc., Union National Bank Bldg., Scranton, Pa.
 WASHBURN & GRANGER, 50 Church St., New York... *p. 91*
 WOODISON CO., E. J., Detroit, Mich... *p. 463*

—**Insulating**
 CELITE PRODUCTS CO., 11 Broadway, New York... *p. 98*
 Didier-March Co., P. O. Box 327, Perth Amboy, N. J.
 *QUIGLEY FURNACE SPECIALTIES CO., 26 Cortlandt St., New York... *pp. 94, 100*

—**Magnesia**
 Harbison-Walker Refractories Co., Farmers' Bank Bldg., Pittsburgh, Pa.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*

—**Rubbing**
 NORTON CO., Worcester, Mass... *p. 391*

—**Silica**
 Gardner, Jr., Co., James, Ebensburg, Pa.
 Harbison-Walker Refractories Co., Farmers' Bank Bldg., Pittsburgh, Pa.
 Kier Fire Brick Co., 2243 Oliver Bldg., Pittsburgh, Pa.

BRICK MACHINERY
 ANDERSON FOUNDRY & MACHINE WORKS, Anderson, Ind... *p. 27*
 Arnold-Creager Co., New London, O.
 BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*
 BONNOT CO., Canton, O... *p. 464*
 CHAMBERS BROS. CO., Philadelphia, Pa... *p. 480*
 Excelsior Tool & Machine Co., East St. Louis, Mo.
 Freese & Co., E. M., 180 South St., Galion, O.
 Schultz & Son, A. L., 1675 Elston St., Chicago, Ill.

SLOCUM, AVRAM & SLOCUM LABORATORIES, INC., 531-537 W. 21st St., New York... *p. 538*
 Stevenson Co., Wellsville, O.
 Wellington Machine Co., Wellington, O.

BRIDGE TRAMWAYS
 (See Tramways, Bridge)

BRIDGES
 —**Movable**
 American Bridge Co., 30 Church St., New York

—**Steel**
 BLAW-KNOX CO., Pittsburgh, Pa... *p. 489*
 Continental Bridge Co., Peotone, Ill.
 Dominion Bridge Co., Ltd., Montreal, P. Q., Canada
 McClintic-Marshall Co., 1217 Oliver Bldg., Pittsburgh, Pa.
 Poenix Iron Co., 410 Walnut St., Philadelphia, Pa.

—**Stocking and Reclaiming**
 (See Tramways, Bridge)

—**Suspension**
 *ROEBLING'S SONS CO., JOHN A., Trenton, N. J... *p. 281*

BRIQUETTING MACHINERY
 CHAMBERS BROS. CO., Philadelphia, Pa... *p. 480*
 General Briquetting Co., 25 Broad St., New York

—**Coal**
 General Briquetting Co., 25 Broad St., New York
 Malcolmson Briquet Engineering Co., Old Colony Bldg., Chicago, Ill.
 Mashek Engineering Co., 90 West St., New York

BROACHING MACHINES
 Lapointe Co., J. N., New London, Conn.
 LAPOINTE MACHINE TOOL CO., Hudson, Mass... *p. 351*
 WATSON-STILLMAN CO., 35 Church St., New York... *p. 457*

—**Hydraulic**
 GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis... *p. 455*

BRONZE POWDER, ALUMINUM
 ALUMINUM CO. OF AMERICA, Pittsburgh, Pa... *p. 294*

BRONZE WORK (Ornamental)
 (See Ornamental Work)

BRONZES
 —**Acid Resistant**
 Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.

—**Bearing**
 ALLAN & SON, A., Harrison, N. J... *pp. 286, 287*

*AMERICAN BRONZE CORP'N (Non-Gran), Berwyn, Pa... *pp. 288, 289*
 BUNTING BRASS & BRONZE CO., 729 Spencer St., Toledo, O... *p. 285*
 LUMEN BEARING CO., Buffalo, N. Y... *p. 290*

—**Manganese**
 Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.
 ALLAN & SON, A., Harrison, N. J... *pp. 286, 287*

LUMEN BEARING CO., Buffalo, N. Y... *p. 290*

—**Phosphor**
 Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.
 ALLAN & SON, A., Harrison, N. J... *pp. 286, 287*

AMERICAN BRASS CO., Waterbury, Conn. *p. 295*
 LUMEN BEARING CO., Buffalo, N. Y... *p. 290*

—**Plastic**
 Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.
 ALLAN & SON, A., Harrison, N. J... *pp. 286, 287*

BUCKETS
 —**Clamshell**

BLAW-KNOX CO. (Blaw), Pittsburgh, Pa... *p. 489*

Browning Co., Cleveland, O.
 Haiss Mfg. Co., Inc., George, 141st St. & Rider Ave., New York
 Hayward Co., 50 Church St., New York
 Lakewood Engineering Co., Berea Road, Cleveland, Ohio
 McKenna Co., 1851 E. 38th St., Cleveland, O.

Owen Bucket Co., 406 Rockefeller Bldg., Cleveland, O.
 Smith & Sons Co., Theo., Jersey City, N. J.
 Williams Co., G. H., Erie, Pa.

—**Drag Line**
 Hayward Co., 50 Church St., New York

—**Electrically Operated**
 Hayward Co., 50 Church St., New York

—**Elevator**
 AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa... *p. 200*
 BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

See Catalogue Section for data of firms listed in capital type

BUCKETS (Continued)**—Elevator**

Burrell Mfg. & Supply House, Kankakee, Ill.

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . p. 250

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis. . . pp. 118, 119

Gifford-Wood Co., Hudson, N. Y.

Hendrick Mfg. Co., Carbondale, Pa.

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . p. 194

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill. . . p. 256

Moore & Lorenz Co., 2144-52 Fulton St., Chicago, Ill.

ROBINS CONVEYING BELT CO., Park Row Bldg., New York. . . p. 257

Skillin & Richards Mfg. Co., 4520 Cortlandt St., Chicago, Ill.

Specialty Engineering Co., Allegheny & Trenton Aves., Philadelphia, Pa.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill. . . pp. 258, 259, 260

WILLCOX ENGINEERING CO., Saginaw, Mich. . . p. 516

—Excavating

BLAW-KNOX CO. (Blaw), Pittsburgh, Pa. . . p. 489

Industrial Supply & Equipment Co., 407 Sansom St., Philadelphia, Pa.

INDUSTRIAL WORKS, Bay City, Mich. . . pp. 266, 267

Owen Bucket Co., 406 Rockefeller Bldg., Cleveland, O.

Rochester Excavating Machinery Co., Caledonia, N. Y.

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O. . . p. 272

Williams Co., G. H., Erie, Pa.

—Grab

Andresen-Evans Co., 646 Railway Exchange Bldg., Chicago, Ill.

BLAW-KNOX CO. (Blaw), Pittsburgh, Pa. . . p. 489

*BROWN HOISTING MACHINERY CO., Cleveland, O. . . p. 265

Buffalo Contractors Plant Corp'n, 129 Erie St., Buffalo, N. Y.

Hayward Co., 50 Church St., New York

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y. . . pp. 252, 253

Industrial Supply & Equipment Co., 407 Sansom St., Philadelphia, Pa.

INDUSTRIAL WORKS, Bay City, Mich. . . pp. 266, 267

Orton & Steinbrenner, 608 S. Dearborn St., Chicago, Ill.

Owen Bucket Co., 406 Rockefeller Bldg., Cleveland, O.

ROBINS CONVEYING BELT CO., Park Row Bldg., New York. . . p. 257

Rochester Excavating Machinery Co., Caledonia, N. Y.

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O. . . p. 272

—Hoisting

Stuebner Iron Works, G. L., Hancock St. & Vernon Ave., Long Island City, N. Y.

—Orange Peel

Andresen-Evans Co., 646 Railway Exchange Bldg., Chicago, Ill.

Hayward Co., 50 Church St., New York

Schaeffer Machine Works, 35th & Grays Ferry Road, Philadelphia, Pa.

Smith & Sons, Co., Theo., Jersey City, N. J.

—Self Dumping

*BROWN HOISTING MACHINERY CO., Cleveland, O. . . p. 265

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y. . . pp. 252, 253

Sackett Screen & Chute Co., H. B., 1679-1691 Elston Ave., Chicago, Ill.

BULL RING METAL

ALLAN & SON, A., Harrison, N. J. . . pp. 286, 287

BULDOZERS

Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, O.

New Doty Mfg. Co., Janesville, Wis.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344

Rock River Machine Co., Janesville, Wis.

TOLEDO MACHINE & TOOL CO., Toledo, O. . . p. 313

WATSON-STILLMAN CO., 35 Church St., New York. . . p. 457

WILLIAMS, WHITE & CO., Moline, Ill. . . p. 314

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

Buc

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O. . . *pp.* 48, 49, 321

KENWORTHY, INC., CHARLES F., Waterbury, Conn. . . *pp.* 414, 415

Lockett & Co., Ltd., A. M., New Orleans, La.

MacLeod Co., Bogen St., Cincinnati, O.

Maxon Premix Burner Co., Muncie, Ind.

Metals Production Equipment Co., 105 W. 40th St., New York

Monarch Mfg. Works, 3130 Emery St., Philadelphia, Pa.

National Supply Co., 416 W. Grand Ave., Chicago, Ill.

Naudain, John E., Sparrows Point, Md.

Reid Gas Engine Co., Joseph, Oil City, Pa.

ROCKWELL & CO., W. S., 50 Church St., New York. . . *p.* 413

*SPRAY ENGINEERING CO., 93 Federal St., Boston, Mass. . . *p.* 113

TATE-JONES & CO., INC., Pittsburgh, Pa. . . *pp.* 416, 417

—Oil (Rotary)

Fess System Co., 220 Natoma St., San Francisco, Cal.

Johnson Co., S. T., 1337 Mission St., San Francisco, Cal.

—Powdered Fuel

*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York. . . *p.* 93

*QUIGLEY FURNACE SPECIALTIES CO., 26 Cortlandt St., New York. . . *pp.* 94, 100

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . *pp.* 466, 467

—Producer Gas

Syracuse Industrial Gas Co. (Syracuse), 206 McCarthy Bldg., Syracuse, N. Y.

BURNISHERS (Threading Die)

MODERN TOOL CO., Erie, Pa. . . *pp.* 360, 361

BUSHINGS

—Bronze

ALLAN & SON, A., Harrison, N. J. . . *pp.* 286, 287

Aluminum Castings Co., 6205 Carnegie Ave., Cleveland, O.

*AMERICAN BRONZE CORP'N (Non-Gran), Berwyn, Pa. . . *pp.* 288, 289

BUNTING BRASS & BRONZE CO., 729 Spencer St., Toledo, O. . . *p.* 285

DODGE SALES & ENGINEERING CO., Mishawaka, Ind. . . *pp.* 102, 202, 203, 204, 205, 206

*HILL CLUTCH CO., Cleveland, O. . . *p.* 208

Johnson Bronze Co., New Castle, Pa.

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p.* 194

Lee Co., Wm. O., Port Huron, Mich.

LUMEN BEARING CO., Buffalo, N. Y. . . *p.* 290

Niagara Brass Mfg. Co., Inc., 163 Adams St., Buffalo, N. Y.

Sterling Specialty Co., Newcomerstown, O.

—Fibre

*DIAMOND STATE FIBRE CO., Bridgeport, Pa. . . *p.* 298

—Loose Pulley

DODGE SALES & ENGINEERING CO., Mishawaka, Ind. . . *pp.* 102, 202, 203, 204, 205, 206

Graphite Metallizing Co. (Graphalloy), Yonkers, N. Y.

*HILL CLUTCH CO., Cleveland, O. . . *p.* 208

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p.* 194

Nolu Oilless Bearing Co., 6 E. Johnson St., Germantown, Philadelphia, Pa.

—Trolley Wheel

*AMERICAN BRONZE CORP'N (Non-Gran), Berwyn, Pa. . . *pp.* 288, 289

—Wood

Detroit Pulley Co., 1331 Bellevue Ave., Detroit, Mich.

BY-PRODUCT COKE OVEN PLANTS

Koppers Co., H., Union Arcade, Pittsburgh, Pa.

Semet-Solvay Co., Station B., Buffalo, N. Y.

BY-PRODUCT RECOVERY PLANTS

Bartlett Hayward Co., Baltimore, Md.

Gas Machinery Co., 1900 Euclid Ave., Cleveland, O.

General Reduction, Gas & By-Products Co., 49 Wall St., New York

Industrial Electric Furnace Co., 1405 Monadnock Bldg., Chicago, Ill.

Riter-Conley Co., Pittsburgh, Pa.

SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill. . . *p.* 501

C

CABBAGING MACHINES (Scrap Metal)

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis. . . *p.* 455

CABLE MAKING MACHINERY

NEW ENGLAND BUTT CO., Providence, R. I. . . *p.* 484

New England Wire Machinery Co., New Haven, Conn.

TORRINGTON MFG. CO., Torrington, Conn. . . *p.* 483

CABLE RAILWAYS

(See Railways, Cable)

CABLE TESTING APPARATUS

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa. . . *p.* 539

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

Thompson-Levering Co., 325 Arch St., Philadelphia, Pa.

CABLES, ELECTRICAL

(See Wire and Cables, Electrical)

CABLES, WIRE

(See Rope, Wire)

CABLEWAYS

—Excavating

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn. . . *p.* 268

FLORY MFG. CO., S., Bangor, Pa. . . *p.* 269

*LIDGERWOOD MFG. CO., 96 Liberty St., New York. . . *p.* 271

MACOMBER & WHYTE ROPE CO., Kenosha, Wis. . . *p.* 280

Sauerman Bros., 1141 Monadnock Block, Chicago, Ill.

—Hoisting and Conveying

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn. . . *p.* 268

FLORY MFG. CO., S., Bangor, Pa. . . *p.* 269

Horton Co., John T., 242 Bradhurst Ave., New York

*LIDGERWOOD MFG. CO., 96 Liberty St., New York. . . *p.* 271

MACOMBER & WHYTE ROPE CO., Kenosha, Wis. . . *p.* 280

*ROEBLING'S SONS CO., JOHN A., Trenton, N. J. . . *p.* 281

CAGES

—Elevator

WRIGHT WIRE CO., Worcester, Mass. . . *p.* 282

—Mine

HOLMES & BROS., ROBT., Danville, Ill. . . *p.* 270

Ottumwa Iron Works, Ottumwa, Ia.

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O. . . *p.* 272

—Mine (Self-Dumping)

HOLMES & BROS., ROBT., Danville, Ill. . . *p.* 270

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O. . . *p.* 272

Cag

CALENDERS (Rubber Working)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CALORIMETERS

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*
 Ellison, L. M., 214 W. Kinzie St., Chicago, Ill.
 Emerson Apparatus Co., 251 Causeway St., Boston, Mass.

Sargent Steam Meter Co., 800-802 Sibley St., Chicago, Ill.

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... *pp. 534*

*PRECISION INSTRUMENT CO., Detroit, Mich... *p. 524*

Standard Calorimeter Co., East Moline, Ill.

—Gas

*PRECISION INSTRUMENT CO., Detroit, Mich... *p. 524*

Smith Gas Engineering Co., Lexington, O.

CALORIZING (of Metals)

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*

CAN MAKING MACHINERY

American Compressor & Pump Co., 801-805 E. Pratt St., Baltimore, Md.

Ama Machine Co., Max, Bridgeport, Conn.

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*

Leffer & Co., Charles, 49-73 Clymer St., Brooklyn, N. Y.

McDonald Machine Co., 32nd & Shields Ave., Chicago, Ill.

Stecher Co., Chas., 1578 Crossing St., Chicago, Ill.

CAN WASHING MACHINES (Milk)

Dairy Machinery & Construction Co., Derby, Conn.

Hershey Machine & Fdry. Co., Manheim, Pa.

Cal

CANDY MACHINES

Gem Mfg. Co., 1229-43 Goebel St., N. S., Pittsburgh, Pa.

National Equipment Co., Springfield, Mass.

CANNING MACHINERY

Dyett Co., Frank J., 73 John St., Iliion, N. Y.

CAPSTANS

American Hoist & Derrick Co., St. Paul, Minn.

Chase Machine Co., 2313 Elm St., N. W., Cleveland, O.

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

FLORY MFG. CO., S., Bangor, Pa... *p. 269*

Red Wing Iron Works, Red Wing, Minn.

—Electric

Maine Electric Co., 35 Commercial St., Portland, Me.

CAR DUMPERS

McMyler Interstate Co., Bedford, O.

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

CAR LIFTS, MINE (Automatic)

HOLMES & BROS., ROBT., Danville, Ill... *p. 270*

CAR LIGHTING APPARATUS

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York... *p. 505*

CAR PULLERS**—Belt driven**

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp. 258, 259, 260*

—Electric

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... *p. 194*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

Maine Electric Co., 35 Commercial St., Portland, Me.

Toledo Foundry & Machine Co., Toledo, O.

CAR SHOP MACHINERY (Railway)

Greenlee Bros. & Co., Rockford, Ill.

CARBIDE (Cake Form)

Carbic Mfg. Co., Duluth, Minn.

CARBIDE LIGHTS (Portable)

MILBURN CO., ALEXANDER, Baltimore, Md... *p. 420*

CARBONIC ACID GAS MACHINERY

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York... *pp. 30, 117, 431, 447*

CARBURETORS

Holley Bros. Co., 131 Rowena St., Detroit, Mich.

PENBERTHY INJECTOR CO., Detroit, Mich... *pp. 152, 153*

CARBURIZING

*AMERICAN METAL TREATMENT CO., Elizabeth, N. J... *p. 418*

CARRIERS**—Cash and Parcel**

Baldwin & Co., Jas. L., 350-366 Madison St., W. Chicago, Ill.

LAMSON CO., 100 Boylston St., Boston, Mass... *pp. 254, 255*

Universal Tube Co., 142-152 W. Ohio St., Chicago, Ill.

—Pick-up and Delivery

LAMSON CO., 100 Boylston St., Boston, Mass... *pp. 254, 255*

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*

—Pneumatic

(See Tubes, Pneumatic)

CARS**—Ballast**

Rodger Ballast Car Co., 523 Railway Exchange, Chicago, Ill.

—Bottom Dump

Easton Car & Construction Co., Easton, Pa.

National Dump Car Co., 519 Railway Exchange Bldg., Chicago, Ill.

Ralston Steel Car Co., Columbus, O.

—Charging

Easton Car & Constructing Co., Easton, Pa.

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

—Cinder

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p. 496*

Pollock Co., Wm. B., Youngstown, O.

Weimer Machine Works Co., Lebanon, Pa.

—Concreting (Gasoline)

McKeen Motor Car Co., 1222 Webster St., Omaha, Nebr.

—Dump

Bergen Point Iron Works, Foot W. 5th St., Bayonne, N. J.

Easton Car & Construction Co., Easton, Pa.

Kilbourne & Jacobs Mfg. Co., Cor. Lincoln & 4th Sts., Columbus, O.

National Dump Car Co., 519 Railway Exchange Bldg., Chicago, Ill.

Wason Mfg. Co., Springfield, Mass.

—Elevator

Smith-Rhea Co., Baltimore, Md.

—Freight (Drop Bottom)

National Dump Car Co., 519 Railway Exchange Bldg., Chicago, Ill.

Pressed Steel Car Co., Pittsburgh, Pa.

Ralston Steel Car Co., Columbus, O.

—Industrial Railway

Atlas Car & Mfg. Co., Cleveland, O.

Chase Foundry & Mfg. Co., Columbus, O.

Chattanooga Car & Foundry Co., Chattanooga, Tenn.

Easton Car & Construction Co., Easton, Pa.

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y... *pp. 252, 253*

Insley Mfg. Co., E. St. Clair & Only St., Indianapolis, Ind.

International Clay Machinery Co., 1057 Bohlander Ave., Dayton, O.

Kilbourne & Jacobs Mfg. Co., Cor. Lincoln & 4th Sts., Columbus, O.

Lakewood Engineering Co., Berea Road, Cleveland, Ohio.

***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill...*p. 256*

Sackett Screen & Chute Co., H. B., 1679-1691 Elston Ave., Chicago, Ill.

Steele & Sons, J. C., Statesville, N. C.

Stuart Foundry & Machine Works, R. J. & T. H., New Hamburg, N. Y.

Stuebner Iron Works, G. L., Hancock St. & Vernon Ave., Long Island City, N. Y.

Turl Iron & Car Co., Inc., 50 Broad St., New York

United Iron Works Co., Kansas City, Mo.

Watt Mining Car Wheel Co., Barnesville, O.

Youngstown Steel Car Co., 1609 Wilson Ave., Youngstown, O.

—**Ingot**
Easton Car & Construction Co., Easton, Pa.

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa...*p. 496*

PHOENIX IRON WORKS CO., Meadville, Pa...*p. 497*

—**Logging**
Russell Wheel & Foundry Co., Detroit, Mich.

—**Mine**
Associated Engineering Co., Somerset, Ky.

Brownsville Foundry & Machine Co., South Brownsville, Pa.

Easton Car & Construction Co., Easton, Pa.

Hefner & Maysvilles, Grafton, W. Va.

Helmick Foundry & Machine Co., Fairmont, W. Va.

Hockensmith Wheel & Mine Car Co., Penn Station, Pa.

Ottumwa Iron Works, Ottumwa, Ia.

PHOENIX IRON WORKS CO., Meadville, Pa...*p. 497*

Pressed Steel Car Co., Pittsburgh, Pa.

Punxsutawney Foundry & Machine Co., Punxsutawney, Pa.

Sanford-Day Iron Works, Knoxville, Tenn.

Star Mfg. Co., New Lexington, O.

Youngstown Steel Car Co., 1609 Wilson Ave., Youngstown, O.

—**Platform**
Easton Car & Construction Co., Easton, Pa.

—**Railroad**
American Car & Foundry Co., 165 Broadway, New York

Barney & Smith Car Co., Dayton, Ohio

Bettendorf Co., Bettendorf, Ia.

Bradley Car Co., Osgood, Worcester, Mass.

Brill Co., J. G., Philadelphia, Pa.

Cambria Steel Co., Philadelphia, Pa.

Chattanooga Car & Foundry Co., Chattanooga, Tenn.

Harlan & Hollingsworth Corp'n, Wilmington, Del.

Haskell & Barker Car Co., Chicago, Ill.

Keith Car & Mfg. Co., Sagamore, Mass.

Laconia Car Co., Laconia, N. H.

Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.

Pressed Steel Car Co., Pittsburgh, Pa.

Pullman Car Co., Pullman Bldg., Chicago, Ill.

Railston Steel Car Co., Columbus, O.

Standard Steel Car Co., Pittsburgh, Pa.

St. Louis Car Co., St. Louis, Mo.

Wason Mfg. Co., Springfield, Mass.

Youngstown Steel Car Co., 1609 Wilson Ave., Youngstown, O.

—**Railroad (Wood)**
Bradley Car Co., Osgood, Worcester, Mass.

—**Railroad Motor**
Buda Co., Railway Exchange, Chicago, Ill.

Fairmont Gas Engine & Railway Motor Car Co., North Main St., Fairmont, Minn.

Hall-Scott Motor Car Co., Inc., Crocker Bldg., San Francisco, Cal.

Sheffield Car Co., Three Rivers, Mich.

Unit Railway Car Co., Newton, Mass.

—**Scale**
Hoover & Mason, 1407 Railway Exchange, Chicago, Ill.

—**Soaking Pit**
MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa...*p. 496*

PHOENIX IRON WORKS CO., Meadville, Pa...*p. 497*

—**Trolley (Industrial Railway)**
***HUNT CO., INC.**, C. W., West New Brighton, Staten Island, N. Y...*pp. 252, 253*

***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill...*p. 256*

Shevlin Engineering Co., 103 W. 34th St., New York

Wason Mfg. Co., Springfield, Mass.

CARTON SEALING MACHINES
Automatic Weighing Machine Co., 134-140 Commerce St., Newark, N. J.

Union Engineering Co., Cuyahoga & W. 4th St., Cleveland, O.

CARTRIDGE MAKING MACHINERY
East Iron & Machine Co., Lima, Ohio

CASE HARDENING
***AMERICAN METAL TREATMENT CO.**, Elizabeth, N. J...*p. 418*

Kotten Machine Co., West Side Ave. & Penn R. R., Jersey City, N. J.

Matthews Mfg. Co., 104 Gold St., Worcester, Mass.

NUTTALL CO., R. D., Pittsburgh, Pa...*p. 195*

TATE-JONES & CO., INC., Pittsburgh, Pa...*pp. 416, 417*

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...*p. 397*

WORCESTER PRESSED STEEL CO., Worcester, Mass...*p. 305*

CASE AND PARCEL CARRIERS
(See Carriers, Cash and Parcel)

CASING, STEAM PIPE
(See Coverings, Steam Pipe)

CASINGS, STEEL (Boiler)
***CASEY-HEDGES CO.**, Chattanooga, Tenn...*pp. 42, 43*

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O...*pp. 48, 49, 321*

VOGT MACHINE CO., HENRY, Louisville, Ky...*p. 63*

Walton & Son, C. J., 1221 W. Main St., Louisville, Ky.

***WICKES BOILER CO.**, Saginaw, Mich...*p. 66*

CASTING MACHINES
—**Die**
Acme Die Casting Corp'n, 35th St. & Third Ave., Brooklyn, N. Y.

Indiana Die Casting Co., 1016 E. 11th St., Indianapolis, Ind.

Morris Engineering Co., 39 Courtlandt St., New York

—**Pig Iron**
Pittsburgh Coal Washer Co., Fulton Bldg., Pittsburgh, Pa.

***POOLE ENGINEERING & MACHINE CO.**, Woodberry, Baltimore, Md...*pp. 196, 197*

CASTINGS
—**Abrasive Resistant**
American Abrasive Metals Co., 50 Church St., New York

—**Acid-Resistant**
Bethlehem Foundry & Machine Co., South Bethlehem, Pa.

Buffalo Foundry & Machine Co., E. Perry St. & Fillmore Ave., Buffalo, N. Y.

CASTINGS (Continued).**—Acid Resistant**

- ***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill. *pp.* 120, 121, 122, 123
DARLING PUMP & MFG. CO., LTD., Williamsport, Pa. *p.* 124
Duriron Castings Co., 90 West St., New York
Farrar & Trefts, Inc., Perry & Illinois Sts., Buffalo, N. Y.
 ***FULLER-LEHIGH CO.**, Fullerton, Pa. *p.* 92
Germann Bronze Co., Erie, Pa.
KELLY & JONES CO., Greensburg, Pa. *pp.* 130, 131
Nolte Brass Co., Springfield, O.
STEPHENS MFG. CO., ROE, Detroit, Mich. *p.* 138
United States Cast Iron Pipe & Foundry Co., Burlington, N. J.

—Aluminum

- Acme Die Casting Corp'n**, 35th St. & Third Ave., Brooklyn, N. Y.
Aluminum Castings Co. (Lynite), 6215 Carnegie Ave., Cleveland, O.
ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. *p.* 294
AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass. *pp.* 142, 143
BUCKEYE IRON & BRASS WORKS, Dayton, O. *p.* 481
BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa. *p.* 86
D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass. *p.* 144
D & W FUSE CO., Providence, R. I. *p.* 393
Die Casting Co. of New Jersey, Irvington, N. J.
 ***DOEHLER DIE-CASTING CO.**, Brooklyn, N. Y. *p.* 292
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.
Johnson Bronze Co., New Castle, Pa.
Lee Co., Wm. O., Port Huron, Mich.
Light Mfg. & Foundry Co., Pottstown, Pa.
Precision Castings Co., Inc., P. O. Drawer 47, Syracuse, N. Y.
SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York. *p.* 505
STEWART MFG. CORP'N, 4535-4551 Fullerton Ave., Chicago, Ill. *p.* 293
Wunsch & Washburn, 207 Centre St., New York

—Aluminum-Bronze

- Titanium Bronze Co., Inc.**, Sugar St., Niagara Falls, N. Y.

—Brass and Bronze

- ALLAN & SON, A.**, Harrison, N. J. *pp.* 286, 287
Aluminum Castings Co. (Lynux), 6205 Carnegie Ave., Cleveland, O.
 ***AMERICAN BRONZE CORP'N** (Non-Gran), Berwyn, Pa. *pp.* 288, 289
 ***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y. *p.* 140
AMERICAN INJECTOR CO., Detroit, Mich. *p.* 151
American Lubricator Co., Detroit, Mich.
AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass. *pp.* 142, 143
AMERICAN TOOL & MACHINE CO., Boston, Mass. *p.* 490
Arcade Mfg. Co., Freeport, Ill.
Atlas Brass Foundry Co., 980 S. Park St., Columbus, O.
BUCKEYE IRON & BRASS WORKS, Dayton, O. *p.* 481
BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa. *p.* 86
Chrismann-Goodwin Foundry Co., Morgantown, W. Va.
Columbian Bronze Corp'n, 50 Church St., New York City
 ***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill. *pp.* 120, 121, 122, 123
Damascus Bronze Co., Pittsburgh, Pa.
DARLING PUMP & MFG. CO., LTD., Williamsport, Pa. *p.* 124

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass. *p.* 144

***DOEHLER DIE-CASTING CO.**, Brooklyn, N. Y. *p.* 292

D & W FUSE CO., Providence, R. I. *p.* 393
Eastwood Wire Mfg. Co., Belleville, N. J.
Electric Water Sterilizer & Ozone Co., Scottsdale, Pa.

Eureka Mfg. Co., Lincolnton, N. C.
Eynon-Evans Mfg. Co., 15th & Clearfield Sts., Philadelphia, Pa.

Foster, Merriam & Co., Meriden, Conn.

Fraim Lock Co., E. T., Lancaster, Pa.

Germann Bronze Co., Erie, Pa.

GIDDINGS & LEWIS MFG. CO., Fond du Lac, Wis. *p.* 342

Grand Rapids Brass Co., 90 Scribner Ave., N. W., Grand Rapids, Mich.

Hercules Float Works, 200 Franklin St., Springfield, Mass.

HOLMES & BROS., ROBT., Danville, Ill. *p.* 270

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.

KELLY & JONES CO., Greensburg, Pa. *pp.* 130, 131

Lee Co., Wm. O., Port Huron, Mich.

LESLIE CO., Lyndhurst, N. J. *p.* 147

McCLAVE-BROOKS CO., Scranton, Pa. *p.* 87

Moran Flexible Steam Joint Co., Inc., 217-22 Main St., Louisville, Ky.

MORRISON BROS., Dubuque, Ia. *p.* 495

Newman Machine Co., Jackson St. & Sou. Rwy., Greensboro, N. C.

Niagara Brass Mfg. Co., Inc., 163 Adams St., Buffalo, N. Y.

Nolte Brass Co., Springfield, O.

Pacific Metal Works, 153 First St., San Francisco, Cal.

Pittsburgh Brass Mfg. Co., Penn Ave. and 32nd St., Pittsburgh, Pa.

***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa. *pp.* 132, 133

***POOLE ENGINEERING & MACHINE CO.**, Woodberry, Baltimore, Md. *pp.* 196, 197

Precision Castings Co., Inc., P. O. Drawer 47, Syracuse, N. Y.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis. *pp.* 170, 171

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York. *p.* 505

SANDUSKY FOUNDRY & MACHINE CO., Sandusky, O. *p.* 488

STEPHENS MFG. CO., ROE, Detroit, Mich. *p.* 138

Titanium Bronze Co., Inc., Sugar St., Niagara Falls, N. Y.

Triumph Electric Co., Oakley, Cincinnati, O.

Vanadium Metals Co., Groton, Conn.

—Copper

ALLAN & SON, A., Harrison, N. J. *pp.* 286, 287

BUCKEYE IRON & BRASS WORKS, Dayton, O. *p.* 481

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass. *p.* 144

D & W FUSE CO., Providence, R. I. *p.* 393

Nolte Brass Co., Springfield, O.

Titanium Bronze Co., Inc., Sugar St., Niagara Falls, N. Y.

—Die-Molded

Acme Die Casting Corp'n, 35th St. & Third Ave., Brooklyn, N. Y.

American Type Founders Co., 300 Communipaw Ave., Jersey City, N. J.

Die Casting Co. of New Jersey, Irvington, N. J.

***DOEHLER DIE-CASTING CO.**, Brooklyn, N. Y. *p.* 292

Franklin Mfg. Co., H. H., Syracuse, N. Y.

Germann Bronze Co., Erie, Pa.

Indiana Die Casting Co., 1016 E. 11th St., Indianapolis, Ind.

Light Mfg. & Foundry Co., Pottstown, Pa.

Cas

Michigan Smelting & Refining Co., Detroit, Mich.
Milwaukee Die Casting Co., 297 Fourth St., Milwaukee, Wis.
Moberg, Inc., C. J., Mount Vernon, N. Y.
Parker White Metal & Machine Co., 23rd & R. R. Sts., Erie, Pa.
Phoenix Die Casting Co., 21 Illinois St., Buffalo, N. Y.
Precision Castings Co., Inc., P. O. Drawer 47, Syracuse, N. Y.
STEWART MFG. CORP'N, 4535-4551 Fullerton Ave., Chicago, Ill...*p. 293*
UNITED LEAD CO., 111 Broadway, New York...*p. 299*
Weeder Mfg. Co., 20 Sargent St., Hartford, Conn.
Heavy
Carthage Machine Co., Carthage, N. Y.
LYNCHBURG FOUNDRY CO., 816 Peoples Gas Bldg., Chicago, Ill...*p. 156*
Newbold & Son Co., R. S., Norristown, Pa.
United States Cast Iron Pipe & Foundry Co., Burlington, N. J.
Hydraulic
Vanadium Metals Co., Groton, Conn.
Iron
Abramsen Engineering Co., Union Bank Bldg., Pittsburgh, Pa.
Ajax Iron Works, Corry, Pa.
Akerlund & Semmes, 17 Battery Place, New York
American & British Mfg. Co., Bridgeport, Conn.
American Car & Foundry Co., 165 Broadway, New York
***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y...*p. 140*
AMERICAN TOOL & MACHINE CO., Boston, Mass...*p. 490*
ANDERSON FOUNDRY & MACHINE WORKS, Anderson, Ind...*p. 27*
Bagley & Sewall Co., Watertown, N. Y.
BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind...*p. 35*
Bay City Foundry & Machinery Co., 26th & Water Sts., Bay City, Mich.
Birmingham Iron Foundry, Derby, Conn.
Bosworth Ard Mach. & Foundry Co., Anniston, Ala.
Brady Foundry Co., James A., 45th St. & Western Blvd., Chicago, Ill.
Bretting Mfg. Co., C. G., Ashland, Wis.
Brown Clutch Co., Sandusky, O.
***BROWN CO.**, A. & F., 79 Barclay St., New York...*p. 187*
BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa...*p. 86*
Buffalo Foundry & Machine Co., E. Perry St. & Fillmore Ave., Buffalo, N. Y.
***BUILDERS IRON FOUNDRY**, Providence, R. I...*p. 520*
Burhorn Co., Edwin, 71 Wall St., New York
Burr Co., Champaign, Ill.
Cedar Rapids Foundry & Machine Co., 901-908 2nd Ave., W., Cedar Rapids, Iowa
Central Iron Works, Stevens Point, Portage Co., Wis.
Centre Foundry & Machine Co., Wheeling, W. Va.
Chattanooga Car & Foundry Co., Chattanooga, Tenn.
Chester Steel Castings Co., Chester, Pa.
Chickasaw Machine & Foundry Co., Memphis, Tenn.
Chrismann-Goodwin Foundry Co., Morgan-town, W. Va.
Christiana Machine Co., Christiana, Pa.
***CALDWELL & SON CO.**, H. W., 17th St. & Western Ave., Chicago, Ill...*p. 250*
***CASEY-HEDGES CO.**, Chattanooga, Tenn...*pp. 42, 43*
***CENTRAL FOUNDRY CO.**, 90 West St., New York...*p. 155*
***CHAIN BELT CO.**, 735 Park St., Milwaukee, Wis...*pp. 118, 119*
Clayville Foundry & Machine Co., Inc., Clayville, N. Y.

***CLYDE IRON WORKS**, 29th Ave., W., & Michigan St., Duluth, Minn...*p. 268*
COLE MFG. CO., R. D., Newnan, Ga...*p. 41*
Cox & Sons Co., 510 Lafayette Place, Philadelphia, Pa.
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*
Currier & Sons, Cyrus, Newark, N. J.
Cutter, Geo. A., Taunton, Mass.
Dake Engine Co., Grand Haven, Mich.
DARLING PUMP & MFG. CO., LTD., Williamsport, Pa...*p. 124*
D & W FUSE CO., Providence, R. I...*p. 393*
Enterprise Co., Columbiana, Ohio
Eureka Mfg. Co., Lincolnton, N. C.
Fairmount Foundry & Engineering Works, Woonsocket, R. I.
Farrar & Trefts, Inc., Perry & Illinois Sts., Buffalo, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Ferro Machine & Foundry Co., Cleveland, O.
Fillmore Ave. Foundry & Iron Works, Inc., 153 Fillmore Ave., Buffalo, N. Y.
FLORY MACHINE CO., S., Bangor, Pa...*p. 269*
Foster, Merriam & Co., Meriden, Conn.
Franklin Machine Co., 189 Charles St., Providence, R. I.
Frontier Iron Works, 36 Letchworth St., Buffalo, N. Y.
***FULLER-LEHIGH CO.**, Fullerton, Pa...*p. 92*
Gale Mfg. Co., Albion, Mich.
Gardner General Foundry Co., Gardner, Mass.
GIDDINGS & LEWIS MFG. CO., Fond du Lac, Wis...*p. 342*
Glamorgan Pipe & Foundry Co., Lynchburg, Va.
Glover Bros., Frankford, Philadelphia, Pa.
Goodnow Foundry Co., L. H., Fitchburg, Mass.
Great Lakes Engineering Works, Detroit, Mich.
Griffith & Wedge Co., Zanesville, O.
Hanson, Clutch & Machinery Co., Tiffin, Ohio
Hart-Parf Co., Charles City, Iowa
Havana Mfg. Co., Havana, Ill.
Hefner & Maysilles, Grafton, W. Va.
Helmick Foundry & Machine Co., Fairmont, W. Va.
Hershey Machine & Foundry Co., Manheim, Pa.
Hewes & Phillips Iron Works, Newark, N. J.
***HILL CLUTCH CO.**, Cleveland, O...*p. 208*
HOLMES & BROS., ROBT., Danville, Ill...*p. 270*
Hooven, Owens-Rentschler Co., Hamilton, O.
Independent Foundry Co., 741 York St., Portland, Ore.
JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill...*p. 194*
KELLY & JONES CO., Greensburg, Pa...*pp. 130, 131*
Kent Machine Co., Kent, O.
Kline Hardware Co., Allentown, Pa.
Klotz Machine Co., 318 W. Water St., Sandusky, O.
Kutztown Foundry & Machine Co., 421 Chestnut St., Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Leavitt Mfg. Co., Urbana, Ill.
Lebanon Gear & Machine Wks., 15th & Forge Sts., Lebanon, Pa.
***LIDGERWOOD MFG. CO.**, 96 Liberty St., New York...*p. 271*
Lombard Iron Works & Supply Co., Augusta, Ga.
Lumsden & Van Stone Co., 426 First St., South Boston, Mass.
LYNCHBURG FOUNDRY CO., 816 Peoples Gas Bldg., Chicago, Ill...*p. 156*
McCLAVE-BROOKS CO., Scranton, Pa...*p. 87*
McNaughton Mfg. Co., Maryville, Tenn.
MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa...*p. 496*
Nazareth Foundry & Machine Co., 41-45 Easton Road, Nazareth, Pa.
Mecklenburg Iron Works, Charlotte, N. C.

Cas

CASTINGS (Continued)**—Iron**

Michigan Press Co., Ypsilanti, Mich.
 Moore, Edwin A., Foot of Robeson St., Reading, Pa.
 Munson, E. G., Carlton Ave., Utica, N. Y.
 MURRAY IRON WORKS CO., Burlington, Ia., pp. 54, 55
 Myerstown Foundry & Mfg. Co., Inc., 90 West St., New York
 National Foundry Mfg. & Supply Co., Williamsport, Pa.
 Neemes Bros., 206-214 1st St., Troy, N. Y.
 Nelsonville Foundry & Machine Co., Nelsonville, O.
 Newbold & Son Co., R. S., Norristown, Pa.
 NEW ENGLAND BUTT CO., Providence, R. I., p. 484
 Newman Machine Co., Jackson St. & Sou. Rwy., Greensboro, N. C.
 Park Mfg. Co., Charlotte, N. C.
 PHOENIX IRON WORKS CO., Meadville, Pa., p. 497
 *PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa., pp. 132, 133
 *POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md., pp. 196, 197
 Poorman Co., O. O., New Bremen, O.
 Punxsutawney Foundry & Machine Co., Punxsutawney, Pa.
 Reading Iron Co., Reading, Pa.
 ROBINS CONVEYING BELT CO., Park Row Bldg., New York., p. 257
 Russell Wheel & Foundry Co., Detroit, Mich.
 Sneed & Co. Iron Works, Foot of Pine St., Jersey City, N. J.
 Sowers Mfg. Co., 1300 Niagara St., Buffalo, N. Y.
 Standard Engineering Co., Ellwood City, Pa.
 Steacy-Schmidt Mfg. Co., 230 E. Hay St., York, Pa.
 Sterritt-Thomas Foundry Co., 32nd & Smallman Sts., Pittsburgh, Pa.
 Stuart Foundry & Machine Works, R. J. & T. H., New Hamburg, N. Y.
 TEXTILE MACHINE WORKS, Reading, Pa., p. 485
 Thacher & Co., George H., Albany, N. Y.
 Townsend Furnace & Machine Co., Broadway & Rensselaer St., Albany, N. Y.
 Treadwell Engrg. Co., 140 Cedar St., New York
 Union Iron Works, Bangor, Me.
 Union Mfg. Co., New Britain, Conn.
 United Engineering & Foundry Co., Farmers' Bank Bldg., Pittsburgh, Pa.
 United States Cast Iron Pipe & Fdry. Co., Burlington, N. J.
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis., p. 18
 VOGT MACHINE CO., HENRY, Louisville, Ky., p. 63
 WASHBURN & GRANGER, 50 Church St., New York., p. 91
 Watt Mining Car Wheel Co., Barnesville, O.
 Weimer Machine Works Co., Lebanon, Pa.
 Westbrook Elevator Mfg. Co., Inc., Danville, Va.
 West Coast Iron Works, 4601-9 Fourteenth Ave., N. W., Seattle, Wash.
 Wood M. & R. M. Co., Walter A., Hoosick Falls, N. Y.

—Lead

AMERICAN TOOL & MACHINE CO., Boston, Mass., p. 490
 UNITED LEAD CO., 111 Broadway, New York., p. 299

—Malleable Iron

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis., pp. 118, 119
 *CLYDE IRON WORKS, 29th Ave. W. & Michigan St., Duluth, Minn., p. 268
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill., pp. 120, 121, 122, 123
 Industrial Supply & Equipment Co., 407 Sanson St., Philadelphia, Pa.

KELLY & JONES CO., Greensburg, Pa., pp. 130, 131

MALLEABLE IRON FITTINGS CO., Branford, Conn., p. 157
 National Malleable Castings Co., 7706 Platt Ave., Cleveland, O.
 Stowell Co., South Milwaukee, Wis.
 Symington Co., T. H., 30 Church St., New York
 WASHBURN & GRANGER, 50 Church St., New York., p. 91
 Wood, M. & R. M. Co., Walter A., Hoosick Falls, N. Y.

—Manganese Steel

American Manganese Steel Co., 1850 McCormick Bldg., Chicago, Ill.
 *CRANE CO., 836 S. Michigan St., Chicago, Ill., pp. 120, 121, 122, 123
 Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

—Monel Metal

BAYONNE CASTING CO., Bayonne, N. J., p. 291
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill., pp. 120, 121, 122, 123
 Supplee-Biddle Hardware Co., 512 Commerce St., Philadelphia, Pa.

—Nickel

BAYONNE CASTING CO., Bayonne, N. J., p. 291

—Nickel Chromium

Driver-Harris Co., Harrison, N. J.

—Semi-Steel

Birmingham Iron Foundry, Derby, Conn.
 Central Iron Works, Stevens Point, Portage Co., Wis.
 Centre Foundry & Machine Co., Wheeling, W. Va.
 *CLYDE IRON WORKS, 29th Ave. W. & Michigan St., Duluth, Minn., p. 268
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill., pp. 120, 121, 122, 123
 DARLING PUMP & MFG. CO., LTD., Williamsport, Pa., p. 124
 D & W FUSE CO., Providence, R. I., p. 393
 Farrar & Trefts, Inc., Perry & Illinois Sts., Buffalo, N. Y.
 Fillmore Ave. Foundry & Iron Works, Inc., 153 Fillmore Ave., Buffalo, N. Y.
 Frontier Iron Works, 36 Letchworth St., Buffalo, N. Y.
 *FULLER-LEHIGH CO., Fullerton, Pa., p. 92
 Hooven, Owens Rentschler Co., Hamilton, O.
 Independent Foundry Co., 741 York St., Portland, Ore.
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill., p. 194
 MALLEABLE IRON FITTINGS CO., Branford, Conn., p. 157
 MURRAY IRON WORKS CO., Burlington, Ia., pp. 54, 55
 PHOENIX IRON WORKS CO., Meadville, Pa., p. 497
 *PITTSBURGH VALVE FOUNDRY & CONST. CO., Pittsburgh, Pa., pp. 132, 133
 *POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md., pp. 196, 197
 Russel Wheel & Foundry Co., Detroit, Mich.
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis., p. 18
 VOGT MACHINE CO., HENRY, Louisville, Ky., p. 63

—Steel

American Steel Foundries, 1163 McCormick Bldg., Chicago, Ill.
 Atlas Steel Casting Co., 1963 Elmwood Ave., Buffalo, N. Y.
 Bayonne Steel Casting Co., Oak St., Bayonne, N. J.
 Birdshoro Steel Foundry & Machine Co., Birdsboro, Pa.
 Chester Steel Castings Co., Chester, Pa.

Cas

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . *pp. 120, 121, 122, 123*

Eagan-Rogers Steel & Iron Co., Crum Lynne, Pa.

Erie Forge Co., Erie, Pa.

FALK CO., Milwaukee, Wis. . . *pp. 188, 189*

Federal Steel Foundry Co., Chester, Pa.

Hart-Parr Co., Charles City, Iowa

Joyce-Gridland Co., Dayton, O.

KELLY & JONES CO., Greensburg, Pa. . . *pp. 130, 131*

Lobell Car Wheel Co., Wilmington, Del.

Mackintosh, Hemphill & Co., 1227 Liberty St., Pittsburgh, Pa.

MALLEABLE IRON FITTINGS CO., Bradford, Conn. . . *p. 157*

Massillon Steel Casting Co., Massillon, O.

McCord & Co., Chicago, Ill.

Millbury Steel Foundry Co., Millbury, Mass.

National Steel Casting Co., Montpelier, Ind.

OHIO STEEL FOUNDRY CO., Springfield, Ohio. . . *p. 306*

Otis Steel Co., 3131 Lakeside Ave., Cleveland, O.

Penn. Seaboard Steel Corp'n, Franklin Bank Bldg., Philadelphia, Pa.

Philadelphia Roll & Machine Co., 23rd St. & Washington Ave., Philadelphia, Pa.

Pittsburgh Iron & Steel Foundries Co., 314 Oliver Bldg., Pittsburgh, Pa.

Reading Steel Casting Co., Reading, Pa.

Reliance Steel Casting Co., 28th & Smallman St., Pittsburgh, Pa.

Sivyer Steel Casting Co., 37th Ave. & Mitchell St., Milwaukee, Wis.

Standard Steel Works Co., Morris Bldg., Philadelphia, Pa.

Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Treadwell Engrg. Co., 140 Cedar St., New York

UNION SPRING & MFG. CO., 1207 Fulton Bldg., Pittsburgh, Pa. . . *p. 424*

Union Steel Casting Co., Pittsburgh, Pa.

Washington Iron Works, 1100 Seattle Boulevard, Seattle, Wash.

WELLMAN-SEAVER-MORGAN CO., 7000 Central Ave., Cleveland, O. . . *p. 272*

Wharton, Jr., & Co., Inc., Wm., P. O. Box 124, Easton, Pa.

Wheeling Mold & Foundry Co., Farmers' Bank Bldg., Pittsburgh, Pa.

—Structural Iron

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. . . *p. 496*

—Vanadium Steel

Sivyer Steel Casting Co., 37th Ave. & Mitchell St., Milwaukee, Wis.

—White Metal

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass. . . *p. 144*

Die Casting Co. of New Jersey, Irvington, N. J.

*DOEHLER DIE-CASTING CO., Brooklyn, N. Y. . . *p. 292*

Parker White Metal & Machine Co., 23rd & R. Sts., Erie, Pa.

Precision Castings Co., Inc., P. O. Drawer 47, Syracuse, N. Y.

STEWART MFG. CORP'N, 4535-4551 Fullerton Ave., Chicago, Ill. . . *p. 293*

UNITED LEAD CO., 111 Broadway, New York. . . *p. 299*

CAUSTICIZING APPARATUS

SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill. . . *p. 501*

CEMENT

—Asbestos

Hartford Covering Co., 1234 Main St., Hartford, Conn.

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York. . . *p. 162*

Norristown Magnesia & Asbestos Co., Norristown, Pa.

Richards Mfg. Co., 325 Scribners Ave., Grand Rapids, Mich.

—Belt

Alexander Bros., 414 N. 3rd St., Philadelphia, Pa.

Bradford Belting Co., 202 Walnut St., Cincinnati, O.

Grand Rapids Belting Co., 1-3 Ionia Ave., Grand Rapids, Mich.

GRATON & KNIGHT MFG. CO., Worcester, Mass. . . *p. 237*

Holyoke Belting Co., 66-68 Winter St., Holyoke, Mass.

Jewell Belting Co., Hartford, Conn.

MacWatty Belting Co. (Stickfast), 7 Beverly St., Providence, R. I.

Moloney Belting Co., 130 N. Franklin St., Chicago, Ill.

Ulmer Leather Co., Norwich, Conn.

Union Belt Co., Fall River, Mass.

—Caulking

Clark Cast Steel Cement Co., Shelton, Conn.

—Disc Wheel

Gardner Machine Co., Beloit, Wis.

—Iron and Steel

Clark Cast Steel Cement Co., Shelton, Conn.

Smooth-On Mfg. Co., 570-574 Communipaw Ave., Jersey City, N. J.

—Pipe Joint

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . *pp. 120, 121, 122, 123*

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York. . . *p. 162*

Smooth-On Mfg. Co., 570-574 Communipaw Ave., Jersey City, N. J.

United States Graphite Co., Saginaw, Mich.

—Refractory

Betson Plastic Fire Brick Co. (Hi-Heat), Rome, N. Y.

Botfield Specialties Co., 776 S. Swanson St., Philadelphia, Pa.

CELTIC PRODUCTS CO., 11 Broadway, New York. . . *p. 98*

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York. . . *p. 162*

JOINTLESS FIRE BRICK CO., 1879 Kingsbury St., Chicago, Ill. . . *p. 99*

*QUIGLEY FURNACE SPECIALTIES CO. (Hytempte), 26 Cortlandt St., New York. . . *pp. 94, 100*

Smooth-On Mfg. Co., 570-574 Communipaw Ave., Jersey City, N. J.

—Water Resistant

Barrett Co., 17 Battery Place, New York

Smooth-On Mfg. Co., 570-574 Communipaw Ave., Jersey City, N. J.

Union Fibre Co., Winona, Minn.

CEMENT MACHINERY

*ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. . . *p. 15*

BARTLETT & SNOW CO., C. O., Cleveland, O. . . *p. 249*

BLAW-KNOX CO., Pittsburgh, Pa. . . *p. 489*

BONNOT CO., Canton, O. . . *p. 364*

*FULLER-LEHIGH CO., Fullerton, Pa. . . *p. 92*

*HILL CLUTCH CO., Cleveland, O. . . *p. 208*

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p. 194*

*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York. . . *p. 93*

PHOENIX IRON WORKS CO., Meadville, Pa. . . *p. 497*

Reeves Bros. Co., Box K, Alliance, O.

Ruggles-Coles Engineering Co., 50 Church St., New York

Smidth & Co., F. L., 50 Church St., New York

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . *pp. 466, 467*

Vulcan Iron Works, Wilkes-Barre, Pa.

*WORTHINGTON PUMP & MACHINERY CORP'N, 135 Broadway, New York. . . *pp. 30, 117, 431, 447*

CEMENT TESTING MACHINES

OLSEN TESTING MACHINE CO., TINIUS, 500 N. 12th St., Philadelphia, Pa. . . *p. 511*

Cem

CEMENT TESTING MACHINES (Cont'd)

*FULLER-LEHIGH CO., Fullerton, Pa... p. 92

RIEHL BROS. TESTING MACHINE CO.,
1424 N. 9th St., Philadelphia, Pa... p. 512**CENTERING MACHINES**Binghamton Machine Works, 38 Chenango St.,
Binghamton, N. Y.*GREENFIELD TAP & DIE CORP'N, Green-
field, Mass... pp. 374, 375NILES-BEMENT-POND CO., 111 Broadway,
New York... p. 344PRATT & WHITNEY CO., 111 Broadway,
New York... p. 344Whiton Machine Co., D. E., New London,
Conn.**CENTERS**

—Index

Willard Machine & Tool Co., Cincinnati, O.

—Planer

CINCINNATI PLANER CO., Oakley, Cin-
cinnati, O... pp. 338, 339**CENTRIFUGAL PUMPS, SEPARATORS,
ETC.**

(See Pumps, Separators, etc., Centrifugal)

CENTRIFUGALS

—For Sugar, Chemicals, Etc.

AMERICAN TOOL & MACHINE CO., Boston,
Mass... p. 490Cresson-Morris Co., 18th & Allegheny Ave.,
Philadelphia, Pa.SCHAU & UHLINGER, INC., Glenwood Ave.
at Second St., Philadelphia, Pa... pp. 492,
493Sharples Specialty Co., West Chester, Pa.
Tolhurst Machine Works, Troy, N. Y.

—Oil and Waste

DE LAVAL STEAM TURBINE CO., Trenton,
N. J... p. 22D'Olier Centrifugal Pump & Machine Co.,
Morris Bldg., Philadelphia, Pa.OIL & WASTE SAVING MACHINE CO.,
1509 Real Estate Trust Bldg., Philadelphia,
Pa... p. 419SCHAU & UHLINGER, INC., Glenwood Ave.
at Second St., Philadelphia, Pa... pp. 492,
493**CHAIN BELTS AND LINKS**Alvey-Ferguson Co., 75 North Ave., Oakley,
Cincinnati, O.*BALDWIN CHAIN & MFG. CO., Worcester,
Mass... p. 198*CALDWELL & SON CO., H. W., 17th St. &
Western Ave., Chicago, Ill... p. 250*CHAIN BELT CO., 735 Park St., Milwaukee,
Wis... pp. 118, 119Diamond Chain & Mfg. Co., Indianapolis, Ind.
Hobbs Co., Clinton E., 12 Pearl St., Boston,
Mass.JONES FOUNDRY & MACHINE CO., W. A.,
4401 W. 12th St., Chicago, Ill... p. 194*LINK-BELT CO., 39th St. & Stewart Ave.,
Chicago, Ill... p. 256Mey Chain Belt Co., Inc., 82 Washington St.,
Buffalo, N. Y.NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... p. 279ROBINS CONVEYING BELT CO., Park Row
Bldg., New York... p. 257

Stephens-Adamson Mfg. Co., Aurora, Ill.

Stowell Co., South Milwaukee, Wis.

Union Chain & Mfg. Co., Seville, O.

WHITNEY MFG. CO., Hartford, Conn... p.
367**CHAIN GRATE STOKERS**

(See Stokers, Chain Grate)

CHAIN HOISTS, SLINGS, ETC.

(See Hoists, Slings, etc., Chain)

CHAIN MACHINESAtlas Machine Co., 140 Manhan St., Waterbury,
Conn.

Baird Machine Co., Bridgeport, Conn.

Turner, Vaughn & Taylor Co., Cuyahoga Falls
O.**CHAIN TESTING MACHINES**OLSEN TESTING MACHINE CO., TINIUS
500 N. 12th St., Philadelphia, Pa... p. 511RIEHL BROS. TESTING MACHINE CO.,
1424 N. 9th St., Philadelphia, Pa... p. 512**CHAINS**

—Ball

Durbrow & Hearne Mfg. Co., 12 Wooster St.
New York

—Block or Pocket Wheel

Diamond Chain & Mfg. Co., Indianapolis, Ind.
JONES FOUNDRY & MACHINE CO., W. A.,
4401 W. 12th St., Chicago, Ill... p. 194NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... p. 279NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273

Speidel, J. G., Reading, Pa.

—Cable

*CALDWELL & SON CO., H. W., 17th St. &
Western Ave., Chicago, Ill... p. 250Hobbs Co., Clinton E., 12 Pearl St., Boston,
Mass.NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... p. 279NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273

—Coil

*CALDWELL & SON CO., H. W., 17th St. &
Western Ave., Chicago, Ill... p. 250NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... p. 279NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273VAN DORN & DUTTON CO., Cleveland,
O... p. 370

—Crane

Gerdes Co., Inc., 30 Church St., New York

Hobbs Co., Clinton E., 12 Pearl St., Boston,
Mass.Reading Chain & Block Corp'n, Reading, Pa.
Woodhouse Chain Works, Trenton, N. J.NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... p. 279NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273

—Dredge

NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... p. 279NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273

Weimer Chain & Iron Co., Lebanon, Pa.

—Power Transmission

American High Speed Chain Co., 401 South
Illinois, Indianapolis, Ind.*BALDWIN CHAIN & MFG. CO., Worcester,
Mass... p. 198*CALDWELL & SON CO., H. W., 17th St. &
Western Ave., Chicago, Ill... p. 250

Diamond Chain & Mfg. Co., Indianapolis, Ind.

Duckworth Chain & Mfg. Co., Springfield, Mass.

JONES FOUNDRY & MACHINE CO., W. A.,
4401 W. 12th St., Chicago, Ill... p. 194*LINK-BELT CO., 39th St. & Stewart Ave.,
Chicago, Ill... p. 256

Medard Patent Pulley Co., St. Louis, Mo.

*MORSE CHAIN CO., Ithaca, N. Y... p. 199

Union Chain & Mfg. Co., Seville, O.

WELLER MFG. CO., 1820-1856 N. Kostner
Ave., Chicago, Ill... pp. 258, 259, 260WHITNEY MFG. CO., Hartford, Conn...
367

—Pressed Steel

Standard Sand & Machine Co., Cleveland, O.

—Pump

Garland Nut & Rivet Co., West Pittsburgh
Lawrence Co., Pa.VAN DORN & DUTTON CO., Cleveland, O...
p. 370

Cem

—Quarry

NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... *p.* 279
NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... *p.* 273

—Rivettless

Cross Engineering Co., Carbondale, Pa.
Tamaqua Mfg. Co., Tamaqua, Pa.

—Steam Shovel

NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York... *p.* 279
NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... *p.* 273
Weimar Chain & Iron Co., Lebanon, Pa.
Woodhouse Chain Works, Trenton, N. J.

—Wire, Weldless

Bridgeport Chain Co., Bunnell St. & Crescent
Ave., Bridgeport, Conn.
VAN DORN & DUTTON CO., Cleveland, O...
p. 370

CHAMFERING MACHINES, TOOTH

Ingle Machine Co., Rochester, N. Y.
Walker, Charles H., 941 14th Ave., Detroit,
Mich.

CHANNEL FORMING MACHINERY

Yoder Co., 1024 B. O. L. E. Bldg., Cleveland, O.

CHANNELING MACHINES (Mine & Quarry)

INGERSOLL-RAND CO., 11 Broadway, New
York... *pp.* 428, 429
SULLIVAN MACHINERY CO., 121 S. Michi-
gan Ave., Chicago, Ill... *p.* 430

CHARGING MACHINES, FURNACE

ALLIANCE MACHINE CO., Alliance, O... *p.*
264

WELLMAN-SEEVER-MORGAN CO., 7000
Central Ave., Cleveland, O... *p.* 272

CHEMICAL APPARATUS

Bario-Metal Corp'n, 167 W. 18th St., New
York
Bethlehem Foundry & Machine Co., South
Bethlehem, Pa.

Braun Corp'n, Los Angeles, Cal.
Buffalo Foundry & Machine Co., E. Perry St. &
Fillmore Ave., Buffalo, N. Y.

Duriron Castings Co., 90 West St., New York
Hercules Engineering Corp'n, 501—5th Ave.,
New York

PFAUDLER CO., Rochester, N. Y... *p.* 499
SWENSON EVAPORATOR CO., 945 Monad-
nock Block, Chicago, Ill... *p.* 501

Sowers Mfg. Co., 1300 Niagara St., Buffalo,
N. Y.

Standard Scientific Co., 70 Fifth Ave., New
York

CHIMNEYS**—Brick (Radial)**

Bergen & Lindeman, Inc., 120 Liberty St., New
York

Custodis Chimney Construction Co., Alphonse,
95 Nassau St., New York

Heine Chimney Co., 123 W. Madison St.,
Chicago, Ill.

Heinicke, Inc., H. R., 147 Fourth Ave., New
York

Kellogg Co., M. W., 90 West St., New York
Wiederholdt Construction Co., Commonwealth
Trust Bldg., St. Louis, Mo.

—Concrete

General Concrete Construction Co., 431 S.
Dearborn St., Chicago, Ill.

Heine Chimney Co., 123 W. Madison St.,
Chicago, Ill.

Kellogg Co., M. W., 90 West St., New York
Wiederholdt Construction Co., 620 Bank of
Commerce Bldg., St. Louis, Mo.

—Steel

(See Stacks, Steel)

CHIPPERS, WOOD

Carthage Machine Co., Carthage, N. Y.

CHUCKING MACHINES**—Automatic Multiple-Spindle**

BULLARD MACHINE TOOL CO., Bridge-
port, Conn... *p.* 537

GIDDINGS & LEWIS MFG. CO., Fond du
Lac, Wis... *p.* 342

NEW BRITAIN MACHINE CO., New Britain,
Conn... *p.* 336

—Heavy Duty

ACME MACHINE TOOL CO., Cincinnati, O.
... *p.* 319

NILES-BEMENT-POND CO., 111 Broadway,
New York... *p.* 344

—Turret

ACME MACHINE TOOL CO., Cincinnati,
O... *p.* 319

BULLARD MACHINE TOOL CO., Bridge-
port, Conn... *p.* 537

INTERNATIONAL MACHINE TOOL CO.,
1124 W. 21st St., Indianapolis, Ind... *pp.*
322, 323

*JONES & LAMSON MACHINE CO., Spring-
field, Vt... *pp.* 324, 325, 326, 327

NILES-BEMENT-POND CO., 111 Broadway,
New York... *p.* 344

STEINLE TURRET MACHINE CO., Madi-
son, Wis... *p.* 332

TURNER MACHINE CO. (Quint), Dan-
bury, Conn... *p.* 347

WOOD TURRET MACHINE CO. (Tilted
Turret), Brazil, Ind... *pp.* 330, 331

CHUCKS**—Air-Operated**

Hannifin Mfg. Co., Chicago, Ill.
MANUFACTURERS EQUIPMENT CO., Wal-
ter & Fillmore Sts., Chicago, Ill... *p.* 382

—Drill

Almond Mfg. Co., T. R., Ashburnham, Mass.
Cushman Chuck Co., Hartford, Conn.

Horton & Son Co., E., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.

McCROSKY-REAMER CO., Meadville, Pa...
pp. 380, 381

MODERN TOOL CO., Erie, Pa... *pp.* 360, 361
Narragansett Machine Co., Providence, R. I.

Nielsen-Barton Chuck Co. (Eclipse), 106 S.
Jefferson St., Chicago, Ill.

Oneida National Chuck Co., Oneida, N. Y.
Pratt Chuck Co., Frankford, N. Y.

Proconier, William L., 549 Washington Blvd.,
Chicago, Ill.

Skinner Chuck Co., New Britain, Conn.

Standard Tool Co., 6900 Central Ave., Cleve-
land, O.

Trump Bros. Machine Co. (Trump), Beech &
Anchorage Sts., Wilmington, Del.

Union Mfg. Co., New Britain, Conn.

Wahlstrom Tool Co., 5520 2nd Ave., Brooklyn,
N. Y.

Weaver Mfg. Co., Springfield, Ill.

Westcott Chuck Co., Oneida, N. Y.

WHITNEY MFG. CO., Hartford, Conn... *p.*
367

—Lathe

AMERICAN TOOL & MACHINE CO., Bos-
ton, Mass... *p.* 490

Almond Mfg. Co., T. R., Ashburnham, Mass.

Cushman Chuck Co., Hartford, Conn.

HOGGSON & PETTIS MFG. CO., New Haven,
Conn... *pp.* 394, 395, 396

Horton & Son Co., E., Windsor Locks, Conn.

Leavitt Machine Co., Orange, Mass.

Oneida National Chuck Co., Oneida, N. Y.

Pratt Chuck Co., Frankford, N. Y.

Skinner Chuck Co., New Britain, Conn.

Thomas Elevator Co., 22 S. Hoynes Ave.,
Chicago, Ill.

Union Mfg. Co., New Britain, Conn.

—Magnetic

D & W FUSE CO., Providence, R. I... *p.* 393

Heald Machine Co., Worcester, Mass.

Persons-Arter Machine Co., 72 Commercial St.,
Worcester, Mass.

CHUCKS (Continued)—**Magnetic**

Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

—**Planer**

CINCINNATI PLANER CO., Oakley, Cincinnati, O. . . pp. 338, 339

—**Ring Wheel**

Gardner Machine Co., Beloit, Wis.

—**Tapping**

Errington Mechanical Laboratory, 39 Cortlandt St., New York

MCCROSKY REAMER CO., Meadville, Pa. . . pp. 380, 381

MODERN TOOL CO., Erie, Pa. . . pp. 360, 361

Peter Brothers' Mfg. Co., Algonquin, Ill.

Scully-Jones Co., Chicago, Ill.

Skilling & Richards Mfg. Co., 4520 Cortlandt St., Chicago, Ill.

Westcott Chuck Co., Oneida, N. Y.

WHITNEY MFG. CO., Hartford, Conn. . . p. 367

Whiton Machine Co., D. E., New London, Conn.

CHUTES

Acme Waste Chute, Box 65, Ridgewood, N. J.

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . p. 250

—**Gravity (Spiral)**

Alvey-Ferguson Co., 75 North Ave., Oakley, Cincinnati, O.

DODGE SALES & ENGINEERING CO., Mishawaka, Ind. . . pp. 202, 203, 204, 205, 206

Haslett Spiral Chute Co., S. E. Cor. Westmoreland & 23rd Sts., Philadelphia, Pa.

LAMSON CO., 100 Boylston St., Boston, Mass. . . pp. 254, 255

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill. . . p. 256

Lowerator Co., Inc., 631-633 Kent Ave., Brooklyn, N. Y.

Mathews Gravity Carrier Co., Ellwood City, Pa.

Moore & Lorenz Co., 2144-52 Fulton St., Chicago, Ill.

Olson & Co., Samuel, 2418-22 Bloomingdale Ave., Chicago, Ill.

Otis Elevator Co., 11th Ave. & 26th St., New York

Rownsen, Drew & Clydesdale, Inc., 12 Bridge St., New York

STANDARD CONVEYOR CO., North St. Paul, Minn. . . p. 261

—**Laundry (Glass Enameled Steel)**

PFAUDLER CO., Rochester, N. Y. . . p. 499

—**Measuring**

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y. . . pp. 252, 253

CIGAR MACHINERY

Miller, DuBrul & Peters Mfg. Co., 507-521 E. Pearl St., Cincinnati, O.

CIGARETTE MACHINERY

Miller, DuBrul & Peters Mfg. Co., 507-521 E. Pearl St., Cincinnati, O.

CINDER MILLS

(See Mills, Cinder)

CIRCUIT BREAKERS

Automatic Reclosing Circuit Breaker Co., 38 N. Water St., Columbus, O.

Condit Electrical Mfg. Co., 838 Summer St., South Boston, Mass.

Equitherm Control Corp'n, 30 Church St., New York

*GENERAL ELECTRIC CO., Schenectady, N. Y. . . pp. 20, 21, 521

Roller-Smith Co., 233 Broadway, New York

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . pp. 114, 115

CIRCULATORS, FEED WATER

Borromite Co. of America, 105 W. Monroe St., Chicago, Ill.

Boston Scale & Machine Co., 100 Rugges St., Boston, Mass.

Eckliff Circulator Co. (Eckliff), 46 Shelby St. Detroit, Mich.

Ross Schofield Co., 17 Battery Place, New York

Waters Co., Geo. H., West New Brighton, N. Y.

CLAMPING DEVICES (Air-Operated)

Hannifin Mfg. Co., Chicago, Ill.

MANUFACTURERS EQUIPMENT CO., Walder & Fillmore Sts., Chicago, Ill. . . p. 382

CLAMS—**Belt**

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . p. 250

DODGE SALES & ENGINEERING CO., Mishawaka, Ind. . . pp. 202, 203, 204, 205, 206

*WOOD'S SONS CO., T. B., Chambersburg, Pa. . . pp. 212, 213

—**Cable**

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. . . p. 294

DIAMOND EXPANSION BOLT CO., 90 West St., Cor. Cedar, New York. . . p. 409

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . pp. 114, 115

—**Guy**

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York. . . p. 279

—**Machine Table**

STANDARD SHOP EQUIPMENT CO., 1413 Somerset St., Philadelphia, Pa. . . p. 384

—**Machinists**

MARK MFG. CO., P. O. Box G, Chicago, Ill. . . p. 160

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y. . . p. 397

—**Pipe**

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y. . . p. 140

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123

DIAMOND EXPANSION BOLT CO., 90 West St., Cor. Cedar, New York. . . p. 409

Power Plant Specialties, 219 Ruffner St., Lockland, O.

Skinner Co., M. B., 558-562 Washington Boul., Chicago, Ill.

*YARNALL-WARING CO. (Yarway), 7603-20 Queen St., Chestnut Hill, Philadelphia, Pa. . . p. 139

—**Strap**

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y. . . p. 397

CLASSIFIERS

Dorr Co., 1009 17th St., Denver, Colo.

CLAY, FIRE

Ashland Fire Brick Co., Ashland, Ky.

Dover Fire Brick Co., 509 Cuyahoga Bldg., Cleveland, O.

Gardner, Jr., Co., James, Ebensburg, Pa.

Kentucky Southern Refractories Co., Fort Payne, Ala.

Maurer & Son, Henry, 420 E. 23rd St., New York

Pyro Clay Products Co., Oak Hill, Ohio

Taylor Sons Co., Charles, Cincinnati, O.

CLAY WASHING MACHINERY

Patterson Foundry & Machine Co., East Liverpool, O.

CLAY WORKING MACHINERY

American Clay Mch. Co., Bucyrus, O.

Arnold-Creager Co., New London, O.

BARTLETT & SNOW CO., C. O., Cleveland, O. . . p. 249

BONNOT CO., Canton, O. . . p. 364

CHAMBERS BROS. CO., Philadelphia, Pa. . . p. 480

Crossley Machine Co., State & Monmouth Sts., Trenton, N. J.

Freese & Co. E. M., 180 South St., Galion, O.

International Clay Machinery Co., 1057 Boblander Ave., Dayton, O.

Chu

Ruggles-Coles Engineering Co., 50 Church St., New York

Steele & Sons, J. C., Statesville, N. C.

*WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill... pp. 468, 469

CLEVELANDS

Cleveland City Forge & Iron Co., 45th St. & Lakeside Ave., Cleveland, O.

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... p. 279

CLOTH

—Abrasive

CARBORUNDUM CO., Niagara Falls, N. Y... p. 389

—Bolting

Abbe, Paul O. (Dufour), 30 Broad St., New York

Munson Mill Machinery Co., Inc., 405 Broadway, Utica, N. Y.

—Filter

Shriver & Co., T., 844 Hamilton St., Harrison, N. J.

—Rubber

Consolidated Rubber Co., Trenton, N. J.
GOODRICH RUBBER CO., B. F., Akron, O... pp. 183, 242

—Wire

Buffalo Wire Works Co., Buffalo, N. Y.

Clinton Wire Cloth Co., Boston, Mass.

Darby & Sons Co., Inc., Edward, 233-235 Arch St., Philadelphia, Pa.

Howard & Morse, 45 Fulton St., New York

Michigan Wire Cloth Co., 536¹/₂ Howard St., Detroit, Mich.

Morse & Whyte Co., Cambridge, Mass.

New Jersey Wire Cloth Co., Trenton, N. J.

Rogers Wire Works, Inc., 291 Broadway, New York

WRIGHT WIRE CO., Worcester, Mass... p. 282

CLOTH COATING MACHINERY

Carrier & Sons, Cyrus, Newark, N. J.

CLOTH, PAPER, RUBBER, ETC., TESTING MACHINES

OLSEN TESTING MACHINE CO., TINIUS, 500 N. 12th St., Philadelphia, Pa... p. 511

RIEHLÉ BROS. TESTING MACHINE CO., 1424 N. 9th St., Philadelphia, Pa... p. 512

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

CLUTCHES

—Automobile

Brown-Lipe Gear Co., Syracuse, N. Y.

Hilliard Clutch & Machinery Co., Elmira, N. Y.

Multi Cone Clutch Co., Erie Bldg., Cleveland, O.

—Friction

AMERICAN TOOL & MACHINE CO., Boston, Mass... p. 490

Bicknell-Thomas Co., Greenfield, Mass.

Blevney Machine Co., Greenfield, Mass.

Brown Clutch Co., Sandusky, O.

*BROWN CO., A. & F., 79 Barclay St., New York... p. 187

CALDWELL CO., INC., W. E., 340 E. Branders St., Louisville, Ky... p. 201

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... p. 250

Carruthers-Pithian Clutch Co., Grove City, Pa.

CHAMBERS BROS. CO., Philadelphia, Pa... p. 480

Conway & Co., Brighton, Cincinnati, O.

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 202, 203, 204, 205, 206

Edgemont Machine Co., Dayton, O.

*FALLS CLUTCH & MACHINERY CO., Cuyahoga Falls, O... p. 207

Fremont Clutch Co., Fremont, O.

Hanson Clutch & Machinery Co., Tiffin, O.

Havana Mfg. Co., Havana, Ill.

Hess-Snyder Co., Massillon, O.

*HILL CLUTCH CO., Cleveland, O... p. 208

Hilliard Clutch & Machinery Co., Elmira, N. Y.

JOHNSON MACHINE CO., CARLYLE, Manchester, Conn... p. 209

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... p. 194

Kinney Mfg. Co., Jamaica Plain, Boston, Mass.

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... p. 256

McMahon & Co., Worcester, Mass.

Mason & Co., Inc., Volney W., 2 Lafayette St., Providence, R. I.

Medart Patent Pulley Co., St. Louis, Mo.

Milwaukee Shaper & Transmission Appliance Co., 1148-50 Holton St., Milwaukee, Wis.

Minster Machine Co., Minster, O.

Moore & White Co., Philadelphia, Pa.

Multi Cone Clutch Co., Erie Bldg., Cleveland, O.

"Never-Slip" Clutch Co., Noblesville, Ind.

O. K. Clutch & Machinery Co., Columbia, Pa.

Plamondon Mfg. Co., A., 12 N. Clinton St., Chicago, Ill.

Reliance Gauge Column Co. (Cleveland), Cleveland, Ohio

Schenck Mfg. & Supply Co., Parkers Landing, Pa.

Schultz & Son., A. L., 1675 Elston St., Chicago, Ill.

Standard Pulley Co., 1734 Powers St., Cincinnati, O.

Thomas Coupling Co., Troy, Pa.

Twin Disc Clutch Co., Racine, Wis.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... pp. 258, 259, 260

WELLMAN-SEAVER-MORGAN CO., 7000 Central Ave., Cleveland, O... p. 272

WILLIAMS FOUNDRY & MACHINE CO. (Akron), 54-56 Cherry St., Akron, O... p. 214

*WOOD'S SONS CO., T. B., Chambersburg, Pa... pp. 212, 213

Yocom & Son, Jas., 145 N. 2nd St., Philadelphia, Pa.

—Magnetic

Cutler-Hammer Mfg. Co., 12th St. & Paul Ave., Milwaukee, Wis.

COAL AND ASH HANDLING MACHINERY

Alvey-Ferguson Co., 75 North Ave., Oakley, Cincinnati, O.

American Conveyor Co., 6611 Drexel Ave., Chicago, Ill.

American Machinery Co., 103 W. Water St., Milwaukee, Wis.

AMERICAN STEAM CONVEYOR CORP'N, 326 W. Madison St., Chicago, Ill... p. 101

Andresen-Evans Co., 646 Railway Exchange Bldg., Chicago, Ill.

Associated Engineering Co., Somerset, Ky.

BARTLETT & SNOW CO., C. O., Cleveland, O... p. 249

Beaumont Co., R. H., 450 Chestnut St., Philadelphia, Pa.

Bergen Point Iron Works, Foot W. 5th St., Bayonne, N. J.

BLAW-KNOX CO., Pittsburgh, Pa... p. 489

*BROWN HOISTING MACHINERY CO., Cleveland, O... p. 265

BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill... p. 262

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... p. 250

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis... pp. 118, 119

Cross Engineering Co., Carbondale, Pa.

De Pere Mfg. Co., 122 S. Michigan Ave., Chicago, Ill.

Gifford-Wood Co., Hudson, N. Y.

Guarantee Construction Co., 90 West St., New York

Hais Mfg. Co., Inc., George, 141st St. & Rider Ave., New York

Hayward Co., 50 Church St., New York

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y... pp. 252, 253

Illinois Stoker Co., Alton, Ill.

Coa

See Catalogue Section for data of firms listed in capital type

COAL AND ASH HANDLING MACHINERY

(Continued)

- INDUSTRIAL WORKS**, Bay City, Mich... *pp.* 266, 267
Jeffrey Mfg. Co., 904 N. Fourth St., Columbus, O.
 ***LIDGERWOOD MFG. CO.**, 96 Liberty St., New York... *p.* 271
 ***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill... *p.* 256
 ***LOCOMOTIVE PULVERIZED FUEL CO.**, 30 Church St., New York... *p.* 93
McKee & Co., Arthur G., Rockefeller Bldg., Cleveland, O.
Mead-Morrison Mfg. Co., Prescott & Orleans Sts., East Boston, Mass.
PORTABLE MACHINERY CO., INC., Passaic, N. J... *p.* 263
ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p.* 257
 ***SHEPARD ELECTRIC CRANE & HOIST CO.**, Montour Falls, N. Y... *pp.* 274, 275
Specialty Engineering Co., Allegheny & Trenton Aves., Philadelphia, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Webster Mfg. Co., Tiffin, O.
WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp.* 258, 259, 260
COAL BREAKERS AND CLEANERS
Pennsylvania Crusher Co. (Bradford), Stephen Girard Bldg., Philadelphia, Pa.
COAL CUTTING MACHINES
Goodman Mfg. Co., Halsted St. & 48th Place, Chicago, Ill.
Morgan-Gardner Electric Co., 27th St. & Shields Ave., Chicago, Ill.
COAL MINING MACHINERY
 ***CASEY-HEDGES CO.**, Chattanooga, Tenn... *pp.* 42, 43
INGERSOLL-RAND CO., 11 Broadway, New York... *pp.* 428, 429
Jeffrey Mfg. Co., 904 North Fourth St., Columbus, Ohio
Kokomo Foundry & Machine Co., Kokomo, Ind.
Mancha Storage Battery Locomotive Co., 1900 S. Kingshighway, St. Louis, Mo.
Pneumelectric Machine Co., 581 S. Clinton St., Syracuse, N. Y.
SULLIVAN MACHINERY CO., 121 S. Michigan Ave., Chicago, Ill... *p.* 430
WELLMAN-SEAEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p.* 272
COAL PREPARING EQUIPMENT
Associated Engineering Co., Somerset, Ky.
BARTLETT & SNOW CO., C. O., Cleveland, O... *p.* 249
 ***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill... *p.* 256
 ***LOCOMOTIVE PULVERIZED FUEL CO.**, 30 Church St., New York... *p.* 93
Pittsburgh Coal Washer Co., Fulton Bldg., Pittsburgh, Pa.
Ruggles-Coles Engineering Co., 50 Church St., New York
Scottdale Machine & Mfg. Co., Scottdale, Pa.
Tamaqua Mfg. Co., Tamaqua, Pa.
Webster Mfg. Co., Tiffin, O.
COAL PUSHERS, MECHANICAL
Locomotive Stoker Co., Robinson & Darrah Sts., Northside, Pittsburgh, Pa.
COAL WASHERS
Pittsburgh Coal Washer Co., Fulton Bldg., Pittsburgh, Pa.
COALING STATIONS, LOCOMOTIVE
Beaumont Co., R. H., 450 Chestnut St., Philadelphia, Pa.
Gifford-Wood Co., Hudson, N. Y.
 ***HUNT CO., INC.**, C. W., West New Brighton, Staten Island, N. Y... *pp.* 252, 253
INDUSTRIAL WORKS, Bay City, Mich... *pp.* 266, 267
 ***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill... *p.* 256

- ***LOCOMOTIVE PULVERIZED FUEL CO.**, 30 Church St., New York... *p.* 93
ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p.* 257

COCKS

—Air and Gage

- AMERICAN INJECTOR CO.**, Detroit, Mich... *p.* 151
AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp.* 142, 143
Bonar & Co., James, 502 Park Bldg., Pittsburgh, Pa.
BUCKEYE IRON & BRASS WORKS, Dayton, O... *p.* 481
Chaplin-Fulton Mfg. Co., 28 Penn Ave., Pittsburgh, Pa.
 ***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123
CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p.* 527
Detroit Brass Works, 99 Hobart Ave., Detroit, Mich.
DETROIT LUBRICATOR CO., Detroit, Mich... *p.* 167
 ***HOMESTEAD VALVE MFG. CO.**, P. O. Box 1754, Pittsburgh, Pa... *p.* 126
Huyette Co., Paul B. (P. B. H.), 18th & Market Sts., Philadelphia, Pa.
 ***JENKINS BROS.**, 80 White St., New York... *pp.* 128, 129
LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... *pp.* 127, 528
McRae & Roberts Co., Detroit, Mich.
Nason Mfg. Co. (Aetna), 71 Fulton St., New York
PENBERTHY INJECTOR CO., Detroit, Mich... *pp.* 152, 153
"S-C" REGULATOR MFG. CO., Fostoria, O... *p.* 72
WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa... *pp.* 432, 433
Williams Gauge Co., 543 Fourth Ave., Pittsburgh, Pa.
 —Ball
D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass... *p.* 144
 —Blowoff
 ***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y... *p.* 140
Cadman Mfg. Co., A. W., 2814 Smallman St., Pittsburgh, Pa.
 ***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123
Eastwood Wire Mfg. Co., Belleville, N. J.
 ***HOMESTEAD VALVE MFG. CO.**, P. O. Box 1754, Pittsburgh, Pa... *p.* 126
Judson Governor Co., Rochester, N. Y.
McRae & Roberts Co., Detroit, Mich.
 ***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa... *pp.* 132, 133
PRATT & CADY CO., INC., Hartford, Conn... *pp.* 134, 135
SIMMONS CO., JOHN, 110 Center St., New York... *p.* 515
 —Cylinder
BUCKEYE IRON & BRASS WORKS, Dayton, O... *p.* 481
 ***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123
CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p.* 527
HOMESTEAD VALVE MFG. CO., P. O. Box 1754, Pittsburgh, Pa... *p.* 126
McRae & Roberts Co., Detroit, Mich.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Watertown Specialty Co., 124 E. Moulton St., Watertown, N. Y.
 —Oil Regulating
 ***BEST, INC.**, W. N., 11 Broadway, New York... *p.* 411
 —Three-Way and Four-Way
AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp.* 142, 143

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. .pp. 120, 121, 122, 123

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass. .p. 527

*HOMESTEAD VALVE MFG. CO., P. O. Box 1754, Pittsburgh, Pa. .p. 126

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa. .pp. 127, 528

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa. .pp. 132, 133

PRATT & CADY CO., INC., Hartford, Conn. .pp. 134, 135

Trill Indicator Co., Center St., Corry, Pa.

WILFERT CO., JOHN, 258 Broadway, New York. .pp. 136, 137

COCOA MACHINERY

National Equipment Co., Springfield, Mass.

COFFEE MACHINERY

Squier Mfg. Co., Geo. L., Buffalo, N. Y.

COILS, PIPE

Albright, Son & Co., Allentown, Pa.

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. .p. 294

American Tube Bending Co., New Haven, Conn.

AUTOMATIC REFRIGERATING CO., Hartford, Conn. .p. 477

BADGER & SONS CO., E. B., Boston, Mass. .p. 159

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. .pp. 120, 121, 122, 123

Gerdes Co., Inc., 30 Church St., New York

Harris & Co., Arthur, 212 Curtis St., Chicago, Ill.

Lewis, Joseph E., 1218 Warner St., Baltimore, Md.

*NATIONAL PIPE BENDING CO., New Haven, Conn. .pp. 106, 107

Pipe Coiling, Bending & Welding Co., Pittsburgh, Pa.

SIMMONS CO., JOHN, 110 Center St., New York. .p. 515

WILFERT CO., JOHN, 258 Broadway, New York. .pp. 136, 137

Refrigerating

*DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York. .p. 28

*VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis. .p. 18

VOGT MACHINE CO., HENRY, Louisville, Ky. .p. 63

COKE OVEN MACHINERY

ALLIANCE MACHINE CO., Alliance, O. .p. 264

*BROWN HOISTING MACHINERY CO., Cleveland, O. .p. 265

*CASEY-HEDGES CO., Chattanooga, Tenn. .pp. 42, 43

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. .p. 496

WELLMAN-SEAVER-MORGAN CO., 7000 Central Ave., Cleveland, O. .p. 272

COLD ROLLING MACHINERY

BLAKE & JOHNSON CO., Waterbury, Conn. .p. 482

COLD STORAGE PLANTS

Armstrong Machinery Co., 3201-3219 E. Riverside, Spokane, Wash.

AUTOMATIC REFRIGERATING CO., Hartford, Conn. .p. 477

BLAKE & JOHNSON CO., Waterbury, Conn. .p. 482

Castle Refrigerating Machine Co., Indianapolis, Ind.

*DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York. .p. 28

JARVIS ENGINEERING CO., 261 Franklin St., Boston, Mass. .p. 502

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York. .p. 162

Ruemeli-Dawley Mfg. Co., 3023 Chouteau Ave., St. Louis, Mo.

United Iron Works Co. (Sterling), Kansas City, Mo.

*VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis. .p. 18

VOGT MACHINE CO., HENRY, Louisville, Ky. .p. 63

COLLARS, SHAFT

AMERICAN TOOL & MACHINE CO., Boston, Mass. .p. 490

Bliss & Laughlin, Inc., Harvey, Ill.

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky. .p. 201

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. .p. 250

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis. .pp. 118, 119

DODGE SALES & ENGINEERING CO., Mishawaka, Ind. .pp. 202, 203, 204, 205, 206

*HILL CLUTCH CO., Cleveland, O. .p. 208

Middletown Machine Co., Middletown, O.

*ROYERSFORD FOUNDRY & MACHINE CO., 52 N. 5th St., Philadelphia, Pa. .pp. 228, 229

Standard Pressed Steel Co., 20th & Clearfield Sts., Philadelphia, Pa.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill. .pp. 258, 259, 260

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y. .p. 397

*WOOD'S SONS CO., T. B., Chambersburg, Pa. .pp. 212, 213

COLLETS

McCROSKY REAMER CO., Meadville, Pa. .pp. 380, 381

PRATT & WHITNEY CO., 111 Broadway, New York. .p. 344

SLOAN & CHACE MFG. CO., LTD., Sixth Ave. Cor. N. 13th St., Newark, N. J. .p. 357

COLORING

*AMERICAN METAL TREATMENT CO., Elizabeth, N. J. .p. 418

COLUMNS AND BASES, STRUCTURAL

American Cast Iron Pipe Co., Birmingham, Ala.

COMBUSTION CHAMBER ARCHES

(See Arches, Combustion Chamber)

COMBUSTION (CO₂) RECORDERS

Blonck & Co., W. A., Fisher Bldg., Chicago, Ill.

Dwight Mfg. Co., 14 S. Jefferson St., Chicago, Ill.

*FOXBORO CO., INC., Foxboro, Mass. .p. 533

Harger Co., F. D., 325 Ellicott Square, Buffalo, N. Y.

HAYS CORP'N, JOS. W., Michigan City, Ind. .p. 523

*PRECISION INSTRUMENT CO., Detroit, Mich. .p. 524

UEHLING INSTRUMENT CO., 2011 Empire Bldg., New York. .p. 525

COMPOUNDS

—Boiler

Arrow Boiler Compound Co., 510 Commonwealth Trust Bldg., St. Louis, Mo.

Beltine Chemical & Mfg. Co., 401 N. Sangamon St., Chicago, Ill.

Binghamton Boiler Compound Co., Binghamton, N. Y.

Bird-Archer Co., 90 West St., New York

Black Bear Co., 138-144 Temple St., Long Island City, N. Y.

Columbia Graphite Co., Columbia Bldg., Cleveland, O.

Crown Mfg. Co., Cleveland, O.

Dearborn Chemical Co., 332 S. Michigan Ave., Chicago, Ill.

Engineering Supply Co., 2238 N. 9th St., Philadelphia, Pa.

Ferrochem Co., Ltd., 30 Church St., New York

Harris Oil Co., A. W., 326 S. Water St., Providence, R. I.

Hawk-Eye Compound Co., Blue Island, Ill.

International Boiler Cleaning Co., 343 Calvert St., Baltimore, Md.

International Boiler Compound Co., 140-142 W. Austin Ave., Chicago, Ill.

Com

COMPOUNDS (Continued)**—Boiler**

Lake Erie Mfg. Co., 192 Chicago St., Buffalo, N. Y.
 Lynch-Clarisey Co., 3211-3213 S. Wood St., Chicago, Ill.
 McVicker Co., W. B., 115 Broadway, New York
 Metaltene Chemical Co., Cleveland, O.
 National Boiler Specialties Co., Elgin, Ill.
 North American Chemical & Engineering Co., 23 Old Slip, New York
 O'Brien-Northrup Oil & Chem. Co., St. Louis, Mo.
 Paige & Jones Chemical Co., Inc., 15 E. 40th St., New York
 Perolin Co. of America, 1112 W. 37th St., Chicago, Ill.
 Russell-Kinkaid Co., Chicago, Ill.
 Shawmut Chemical Co., 42 Batterymarch St., Boston, Mass.
 Standard Chemical Co., Kal. National Bank Bldg., Kalamazoo, Mich.
 Star Oil Co., 440 N. Halsted St., Chicago, Ill.
 Warley & Co., Thos. C., 227 S. Front St., Philadelphia, Pa.

—Casehardening

Bell & Gossett Co., 2641-2645 Archer Ave., Chicago, Ill.

—Core

Federal Foundry Supply Co., Cleveland, O.
 WOODISON CO., E. J., Detroit, Mich...*p. 463*

—Cutting

American Oil Products Co., 1426 Seneca St., Buffalo, N. Y.
 Atlantic Refining Co., 3144 Passyunk Ave., Philadelphia, Pa.
 Franklin Oil & Gas Co., Bedford, O.
 Harris Oil Co., A. W., 326 S. Water St., Providence, R. I.
 Jobbers Mfg. Co. (Blue Ribbon), 327 S. LaSalle St., Chicago, Ill.
 Kramer Oil Co., W. J., 214-216 Reed St., Milwaukee, Wis.
 Moore Oil Co., York St. & McLean Ave., Cincinnati, O.
 Stuart & Co., D. A., 350-360 E. Illinois St., Chicago, Ill.
 SWAN & FINCH CO. (Larcull), 165 Broadway, New York...*p. 174*
 Warley & Co., Thos. C., 227 S. Front St., Philadelphia, Pa.
 White & Bagley Co., 100 Foster St., Worcester, Mass.
 White Star Refining Co., 614 Avery Ave., Detroit, Mich.

—Elevator

Bird-Archer Co., 90 West St., New York
 McVicker Co., W. B., 115 Broadway, New York
 Warley & Co., Thos. C., 227 S. Front St., Philadelphia, Pa.

—Grinding

CARBORUNDUM CO., Niagara Falls, N. Y...*p. 389*
 Jones Ball Co. (Acme), Arlington Heights, Mass.
 NORTON CO., Worcester, Mass...*p. 391*

—Slushing

Warren Bros. Co., 142 Berkley St., Boston, Mass.

—Tempering

Haring, Ellsworth, 114 Liberty St., New York
 Metal Hardening Solution Co., 64 Raines Park, Rochester, N. Y.

COMPRESSED AIR METERS

(See Meters, Compressed Air)

COMPRESSOR OUTFITS, AIR

Brunner Mfg. Co., Utica, N. Y.
 INGERSOLL-RAND CO., 11 Broadway, New York...*pp. 428, 429*
 NORWALK IRON WORKS CO., So. Norwalk, Conn...*p. 427*
 NOVO ENGINE CO., Lausung, Mich...*pp. 414, 415*

WESTINGHOUSE TRACTION BRAKE CO.

Wilmerding, Pa...*pp. 432, 433*

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*

COMPRESSORS**—Air**

Air Device Mfg. Co., 2977 Cottage Grove Ave., Chicago, Ill.
 *ALLIS-CHALMERS MFG. CO., Milwaukee, Wis...*p. 15*
 American Compressor & Pump Co., 801-805 E. Pratt St., Baltimore, Md.
 American Steam Pump Co., Battle Creek, Mich.
 Black & Decker Mfg. Co. (Lectroflater), 109-15 S. Calvert St., Baltimore, Md.
 Blaisdell Machinery Co., Bradford, Pa.
 Brunner Mfg. Co., Utica, N. Y.
 Bury Compressor Co., Erie, Pa.
 Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill.
 Christensen Engineering Co., 841 30th St., Milwaukee, Wis.
 Clark & Norton Mfg. Co., Wellsville, N. Y.
 Crowell Mfg. Co., 296 Taaffe Place, Brooklyn, N. Y.
 Curtis Pneumatic Machinery Co., St. Louis, Mo.
 DE LAVAL STEAM TURBINE CO., Trenton, N. J...*p. 22*
 Dow Pump & Diesel Engine Co., Alameda, Cal.
 Hall Steam Pump Co., Pittsburgh, Pa.
 HOLMES & BROS., ROBT., Danville, Ill...*p. 270*
 Indiana Air Pump Co., 812 K. of P. Bldg., Indianapolis, Ind.
 INGERSOLL-RAND CO., 11 Broadway, New York...*pp. 428, 429*
 Jackson Compressor Co., Cor. Cherokee & Alameda Sts., Denver, Colo.
 Jacobson Machine Mfg. Co., Warren, Pa.
 Janette Mfg. Co., 625 W. Jackson Blvd., Chicago, Ill.
 McKiernan-Terry Drill Co., 15 Park Row, New York
 Miller Improved Gas Engine Co., Springfield, O.
 Nagle Corlies Engine Works, Erie, Pa.
 Nash Engineering Co. (Hydroturbine), South Norwalk, Conn.
 NORDBERG MFG. CO., Milwaukee, Wis...*p. 19*
 NORWALK IRON WORKS CO., So. Norwalk, Conn...*p. 427*
 Oliver Mfg. Co., Fourth & Madison Sts., Oakland, Cal.
 Rix Compressed Air & Drill Co., 505 Howard St., San Francisco, Cal.
 St. Louis Iron & Machine Works, 126 Chouteau Ave., St. Louis, Mo.
 Stratton & Bragg Co., Petersburg, Va.
 SULLIVAN MACHINERY CO., 121 S. Michigan Ave., Chicago, Ill...*p. 430*
 Taber Pump Co., 291-297 Elm St., Buffalo, N. Y.
 Tranter Mfg. Co., 105 Water St., Pittsburgh, Pa.
 Turbine Equipment Co., 50 Church St., New York
 Turbo Co., 1465 Broadway, New York
 Union Steam Pump Co., Battle Creek, Mich.
 Utility Compressor Co., 355 Harper Ave., E. Detroit, Mich.
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis...*p. 18*
 Weber Subterranean Pump Co., 50 E. 42nd St., New York
 Westinghouse Air Brake Co., Wilmerding, Pa.
 WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa...*pp. 432, 433*
 *WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*
 Zin-Ho Brunner Fdry. & Mchy. Co., 343 S. Dearborn St., Chicago, Ill.

—Air, Compound

Gardner Governor Co., Quincy, Ill.

Com

INGERSOLL-RAND CO., 11 Broadway, New York...*pp.* 428, 429
NORDBERG MFG. CO., Milwaukee, Wis...*p.* 19
NORWALK IRON WORKS CO., So. Norwalk, Conn...*p.* 427
SULLIVAN MACHINERY CO., 121 S. Michigan Ave., Chicago, Ill...*p.* 430
WESTINGHOUSE TRACTION BRAKE CO., Westmading, Pa...*pp.* 432, 433
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp.* 30, 117, 431, 447

—**Ammonia**

AUTOMATIC REFRIGERATING CO., Hartford, Conn...*p.* 477
***DE LA VERGNE MACHINE CO.**, 1123 E. 138th St., New York...*p.* 28
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., 2815-21 Montrose Ave., Chicago, Ill.
Mayer Ice Machine & Engineering Co., Norris St. & Hudson River, Jersey City, N. J.
NORWALK IRON WORKS CO., So. Norwalk, Conn...*p.* 427
St. Louis Iron & Machine Works, 125 Chouteau Ave., St. Louis, Mo.
***VILTER MFG. CO.**, 1194-1196 Clinton St., Milwaukee, Wis...*p.* 18
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp.* 30, 117, 431, 447

—**Centrifugal**

DE LAVAL STEAM TURBINE CO., Trenton, N. J...*p.* 22
***GENERAL ELECTRIC CO.**, Schenectady, N. Y...*pp.* 20, 21, 521

—**Chlorine**

Nash Engineering Co., South Norwalk, Conn.

—**Gas**

Bessemer Gas Engine Co., Grove City, Pa.
Blaisdell Machinery Co., Bradford, Pa.
Bury Compressor Co., Erie, Pa.
Clark & Norton Mfg. Co., Wellsville, N. Y.
DE LAVAL STEAM TURBINE CO., Trenton, N. J...*p.* 22
Hall Steam Pump Co., Pittsburgh, Pa.
INGERSOLL-RAND CO., 11 Broadway, New York...*pp.* 428, 429
Miller Improved Gas Engine Co., Springfield, O.
Nash Engineering Co., South Norwalk, Conn.
NORDBERG MFG. CO., Milwaukee, Wis...*p.* 19
NORWALK IRON WORKS CO., South Norwalk, Conn...*p.* 427
Turbo Co., 1465 Broadway, New York
***VILTER MFG. CO.**, 1194-1196 Clinton St., Milwaukee, Wis...*p.* 18
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp.* 30, 117, 431, 447

CONCENTRATING MACHINERY

Denver Engineering Works Co., Denver, Colo.
Traylor Engrg. & Mfg. Co., Allentown, Pa.

CONCRETE GRAVITY PLANTS

Inslay Mfg. Co., E. St. Clair & Onley Sts., Indianapolis, Ind.
Ransome Concrete Machinery Co., 115 Broadway, New York

CONCRETE INSERTS

***CRANE CO.**, 836 So. Michigan Ave., Chicago, Ill...*pp.* 120, 121, 122, 123
DIAMOND EXPANSION BOLT CO., 90 West St., New York...*p.* 409
***HILL CLUTCH CO.**, Cleveland, O...*p.* 208
Star Expansion Bolt Co., 147-149 Cedar St., New York

CONCRETE MIXING MACHINES

(See Mixers, Concrete)

CONCRETE REINFORCEMENT

***BROWN HOISTING MACHINERY CO.**, Cleveland, O...*p.* 265

Clinton Wire Cloth Co., Boston, Mass.

—**Bars**

Concrete Steel Co., 42 Broadway, New York

—**Mesh**

WRIGHT WIRE CO., Worcester, Mass...*p.* 282

CONDENSATION RETURN SYSTEMS

HOBSON, RUSSELL B. (Holly), New Brighton, N. Y...*p.* 150

CONDENSER TUBES

(See Tubes, Condensers)

CONDENSERS—**Ammonia**

AUTOMATIC REFRIGERATING CO., Hartford, Conn...*p.* 477
***DE LA VERGNE MACHINE CO.**, 1123 E. 138th St., New York...*p.* 28
Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.
***VILTER MFG. CO.**, 1194-1196 Clinton St., Milwaukee, Wis...*p.* 18
VOGT MACHINE CO., HENRY, Louisville, Ky...*p.* 63
—Barometric
Blake Pump & Condenser Co., Fitchburg, Mass.
INGERSOLL-RAND CO., 11 Broadway, New York...*pp.* 428, 429
Kellogg Co., M. W., 90 West St., New York
PHOENIX IRON WORKS CO., Meadville, Pa...*p.* 497
Vertical Condenser Co., Cincinnati, O.
WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p.* 116
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp.* 30, 117, 431, 447

—**Electrical**

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

—**Jet**

Blake Pump & Condenser Co., Fitchburg, Mass.
Blakeslee Mfg. Co., Du Quoin, Ill.
Connorsville Blower Co., Connorsville, Ind.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Elliott Co., Frick Bldg., Pittsburgh, Pa.
EPHING-CARPENTER PUMP CO., Pittsburgh, Pa...*p.* 441
Kerr Machinery Corp'N, Detroit, Mich.
Schutte & Koerting Co., 12th & Thompson Sts., Philadelphia, Pa.
***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa...*pp.* 114, 115
WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p.* 116
WOOD & CO., R. D., Philadelphia, Pa...*p.* 458
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp.* 30, 117, 431, 447

—**Jet, Rotary**

Manistee Iron Works Co., Manistee, Mich.
WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p.* 116
WOOD & CO., R. D., Philadelphia, Pa...*p.* 458

—**Surface**

Alberger Pump & Condenser Co. (Alberger), 140 Cedar St., New York
American Condenser & Engineering Corp'N, 120 Broadway, New York
Baragwanath & Son, Wm., 1633 Monadnock Block, Chicago, Ill.
Braun & Co., C. F., 503 Market St., San Francisco, Cal.
EPHING-CARPENTER PUMP CO., Pittsburgh, Pa...*p.* 441
Ross Heater & Mfg. Co., Inc., 753 Bird Ave., Buffalo, N. Y.
Smalley General Co., Bay City, Mich.
***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa...*pp.* 114, 115

Con

CONDENSERS (Continued)—**Surface**

WHEELER CONDENSER & ENGINEERING
CO., Carteret, N. J., *p. 116*

Wheeler Mfg. Co., C. H., Philadelphia, Pa.
WOOD & CO., R. D., Philadelphia, Pa., *p. 458*

***WORTHINGTON PUMP & MACHINERY**
CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*

CONDUIT—**Electrical**

***JOHNS-MANVILLE CO.,** H. W., 296 Madison
Ave., New York...*p. 162*

MARK MFG. CO., P. O. Box G, Chicago, Ill.
...*p. 160*

National Metal Molding Co., 1110 Fulton Bldg.,
Pittsburgh, Pa.

—**Fibre**

AMERICAN VULCANIZED FIBRE CO.,
Wilmington, Del...*p. 296*

—**Underground**

***JOHNS-MANVILLE CO.,** H. W., 296 Madison
Ave., New York...*p. 162*

—**Wood**

Wyckoff Pipe & Creosoting Co., 30 E. 42nd St.,
New York

CONNECTING RODS

Bryant Chucking Grinder Co., Springfield, Vt.
Leard Co., Wm. E., 16th St. & 5th Ave., New
Brighton, Pa.

PENNSYLVANIA FORGE CO., Bridesburg,
Philadelphia, Pa., *p. 158*

VULCAN STEAM FORGING CO., 247 Rano
St., Buffalo, N. Y., *p. 303*

WILLIAMS & CO., J. H., 70 Richards St.,
Brooklyn, N. Y., *p. 397*

CONTROLLERS—**Automatic, Temperature or Pressure**

(See Regulators)

Con—**Electric**

Allen Bradley Co., Milwaukee, Wis.
Automatic Switch Co., 4-6 White St., New
York

Cline Electric Mfg. Co., Fisher Bldg., Chicago, Ill.
Cutler-Hammer Mfg. Co., 12th St. & St. Paul
Ave., Milwaukee, Wis.

Electric Controller & Mfg. Co., Cleveland, O.
Fort Wayne Engineering & Mfg. Co. (Paul),
Fort Wayne, Ind.

***GENERAL ELECTRIC CO.,** Schenectady,
N. Y., *pp. 20, 21, 521*

General Elevator Co., 29 Broadway, New York
Industrial Controller Co., Milwaukee, Wis.

***WESTINGHOUSE ELECTRIC & MFG. CO.,**
East Pittsburgh, Pa., *pp. 114, 115*

Wheeler-McDowell Elevator Co., 417-421 Canal
St., New York

—**Elevator**

***GENERAL ELECTRIC CO.,** Schenectady,
N. Y., *pp. 20, 21, 521*

Maintenance Co., 417-421 Canal St., New York
***WESTINGHOUSE ELECTRIC & MFG. CO.,**
East Pittsburgh, Pa., *pp. 114, 115*

Wheeler-McDowell Elevator Co., 417-421 Canal
St., New York

—**Elevator Signal**

Kingsbridge Machine Works, Kingsbridge, New
York, N. Y.

***WESTINGHOUSE ELECTRIC & MFG. CO.,**
East Pittsburgh, Pa., *pp. 114, 115*

—**Feed Water**

(See Regulators, Feed Water)

—**Filter Rate**

***BUILDERS IRON FOUNDRY,** Providence,
R. I., *p. 520*

Simplex Valve & Meter Co., 625 Wood St.,
Philadelphia, Pa.

—**Liquid Level**

***FOXBORO CO., INC.,** Foxboro, Mass., *p. 533*

***GENERAL ELECTRIC CO.,** Schenectady,
N. Y., *pp. 20, 21, 521*

Nason Mfg. Co. (Multiservis), 71 Fulton St.,
New York

"S-C" REGULATOR MFG. CO., Postoria, O.,
...*p. 72*

TAGLIABUE MFG. CO., C. J., 18-88 33rd St.,
Brooklyn, N. Y., *p. 535*

***WESTINGHOUSE ELECTRIC & MFG. CO.,**
East Pittsburgh, Pa., *pp. 114, 115*

Williams Gauge Co., 343 Fourth Ave., Pitts-
burgh, Pa.

—**Time**

***FOXBORO CO., INC.,** Foxboro, Mass., *p. 533*

TAGLIABUE MFG. CO., C. J., 18-88 33rd St.,
Brooklyn, N. Y., *p. 535*

CONTROLS, FLEXIBLE LEVER

***GWILLIAM CO. (Bowden),** 253 W. 58th St.,
New York...*pp. 234, 235*

CONVERTERS—**Rotary**

***GENERAL ELECTRIC CO.,** Schenectady,
N. Y., *pp. 20, 21, 521*

Wagner Electric Mfg. Co., 6400 Plymouth Ave.,
St. Louis, Mo.

***WESTINGHOUSE ELECTRIC & MFG. CO.,**
East Pittsburgh, Pa., *pp. 114, 115*

—**Steel**

Mohr & Sons, John, 349-359 W. Illinois St.,
Chicago, Ill.

CONVEYING MACHINERY

Alvey-Ferguson Co., 75 North Ave., Oakley,
Cincinnati, O.

Alvey Mfg. Co., 3201 S. Broadway, St. Louis,
Mo.

American Conveyor Co., 6611 Drexel Ave.,
Chicago, Ill.

BARTLETT & SNOW CO., C. O., Cleveland,
O., *p. 249*

Beaumont Co., R. H., 450 Chestnut St., Phila-
delphia, Pa.

***CALDWELL & SON CO.,** H. W., 17th St. &
Western Ave., Chicago, Ill., *p. 250*

***CHAIN BELT CO.,** 735 Park St., Milwaukee,
Wis., *pp. 118, 119*

CONVEYING WEIGHER CO., 90 West St.,
New York...*p. 251*

De Pere Mfg. Co., 122 S. Michigan Ave., Chicago,
Ill.

DODGE SALES & ENGINEERING CO.,
Mishawaka, Ind., *pp. 202, 203, 204, 205, 206*

Garland Co., M., Bay City, Mich.
Gifford-Wood Co., Hudson, N. Y.

***HILL CLUTCH CO.,** Cleveland, O., *p. 208*

***HUNT CO., INC.,** C. W., West New Brighton,
Staten Island, N. Y., *pp. 252, 253*

JONES FOUNDRY & MACHINE CO., W. A.,
4401 W. 12th St., Chicago, Ill., *p. 194*

LAMSON CO., 100 Boylston St., Boston, Mass.,
...*pp. 254, 255*

***LINK-BELT CO.,** 39th St. & Stewart Ave.,
Chicago, Ill., *p. 256*

Mathews Gravity Carrier Co., Ellwood City,
Pa.

Mead-Morrison Mfg. Co., Prescott & Orleans
Sts., East Boston, Mass.

Mey Chain Belt Co., Inc., 82 Washington St.,
Buffalo, N. Y.

PORTABLE MACHINERY CO., INC.,
Passaic, N. J., *p. 263*

ROBINS CONVEYING BELT CO., Park Row
Bldg., New York...*p. 257*

Rownsdon, Drew & Clydesdale, Inc., 12 Bridge
St., New York

***SHEPARD ELECTRIC CRANE & HOIST**
CO., Montour Falls, N. Y., *pp. 274, 275*

Specialty Engineering Co., Allegheny & Trenton
Aves., Philadelphia, Pa.

STANDARD CONVEYOR CO., North St.
Paul, Minn., *p. 261*

Stephens-Adamson Mfg. Co., Aurora, Ill.
Tamaqua Mfg. Co., Tamaqua, Pa.

Webster Mfg. Co., Tiffin, O.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp.* 258, 259, 260
WILLCOX ENGINEERING CO., Saginaw, Mich... *p.* 516

CONVEYING SYSTEMS, PNEUMATIC

Allington & Curtis Mfg. Co., 400 Holden St., Saginaw, Mich.
LAMSON CO., 100 Boylston St., Boston, Mass... *pp.* 254, 255
Merrill, Inc., C. J., 131 Preble St., Portland, Me.
National Blow Pipe & Mfg. Co., 738 Dryades St., New Orleans, La.
Northern Blower Co., Cleveland, Ohio

—Light Material

STERLING BLOWER CO., Hartford, Conn... *p.* 436

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp.* 74, 75

*WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill... *pp.* 468, 469

CONVEYING WEIGHERS

(See Weighers, Conveying)

CONVEYOR ROLLERS, ADJUSTABLE

Main Belting Co., 1217-1241 Carpenter St., Philadelphia, Pa.

CONVEYORS**—Belt**

Alvey Mfg. Co., 3201 S. Broadway, St. Louis, Mo.

Arnold-Creager Co., New London, O.
BARTLETT & SNOW CO., C. O., Cleveland, O... *p.* 249

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p.* 250

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... *pp.* 202, 203, 204, 205, 206

CONVEYING WEIGHER CO., 90 West St., New York... *p.* 251

Excavating & Screening Machinery Co., 743 Security Bldg., Minneapolis, Minn.

Haslett Spiral Chute Co., S. E. Cor. Westmoreland & 23rd Sts., Philadelphia, Pa.

LAMSON CO., 100 Boylston St., Boston, Mass... *pp.* 254, 255

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p.* 256

Meese & Gottfried Co., 660 Mission St., San Francisco, Cal.

Olsen & Co., Samuel, 2418-22 Bloomingdale Ave., Chicago, Ill.

PORTABLE MACHINERY CO., Passaic, N. J... *p.* 263

ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p.* 257

Stephens-Adamson Mfg. Co., Aurora, Ill.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp.* 258, 259, 260

—Bucket, Pan or Apron

AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa... *p.* 200

BARTLETT & SNOW CO., C. O., Cleveland, O... *p.* 249

BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill... *p.* 262

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p.* 250

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis... *pp.* 118, 119

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... *pp.* 202, 203, 204, 205, 206

Haslett Spiral Chute Co., S. E. Cor. Westmoreland & 23rd Sts., Philadelphia, Pa.

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y... *pp.* 252, 253

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... *p.* 194

LAMSON CO., 100 Boylston St., Boston, Mass... *pp.* 254, 255

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p.* 256

STANDARD CONVEYOR CO., North St. Paul, Minn... *p.* 261

Stephens-Adamson Mfg. Co., Aurora, Ill.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp.* 258, 259, 260

—Continuous Molding

Standard Sand & Machine Co., Cleveland, O.

—Gravity (Roller)

Alvey-Ferguson Co., 75 North Ave., Oakley, Cincinnati, O.

Alvey Mfg. Co., 3201 S. Broadway, St. Louis, Mo.

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p.* 250

Haslett Spiral Chute Co., S. E. Cor. Westmoreland & 23rd Sts., Philadelphia, Pa.

LAMSON CO., 100 Boylston St., Boston, Mass... *pp.* 254, 255

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p.* 256

Lowerator Co., Inc., 631-633 Kent Ave., Brooklyn, N. Y.

Mathews Gravity Carrier Co., Ellwood City, Pa.

STANDARD CONVEYOR CO., North St. Paul, Minn... *p.* 261

—Portable

BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill... *p.* 262

LAMSON CO., 100 Boylston St., Boston, Mass... *pp.* 254, 255

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p.* 256

PORTABLE MACHINERY CO., Passaic, N. J... *p.* 263

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp.* 258, 259, 260

—Screw

BARTLETT & SNOW CO., C. O., Cleveland, O... *p.* 249

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p.* 250

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... *pp.* 202, 203, 204, 205, 206

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p.* 256

Moore & Lorenz Co., 2144-52 Fulton St., Chicago, Ill.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp.* 258, 259, 260

—Sectional

BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill... *p.* 262

PORTABLE MACHINERY CO., INC., Passaic, N. J... *p.* 263

—Spiral

(See Chutes, Gravity, Spiral)

—Tray (Automatic)

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p.* 250

LAMSON CO., 100 Boylston St., Boston, Mass... *pp.* 254, 255

STANDARD CONVEYOR CO., North St. Paul, Minn... *p.* 261

COOLERS**—Brine**

*DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York... *p.* 28

Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.

*VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis... *p.* 18

VOGT MACHINE CO., HENRY, Louisville, Ky... *p.* 63

—Oil

*DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York... *p.* 28

*NATIONAL PIPE BENDING CO., New Haven, Conn... *pp.* 106, 107

PHOENIX IRON WORKS CO., Meadville, Pa... *p.* 497

Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.

Coo

COOLING PONDS, SPRAY

American Spray Co., 26 Courtlandt St., New York

Kauffmann Engineering Co., 3951-53 LaCledé Ave., St. Louis, Mo.

*SPRAY ENGINEERING CO., 93 Federal St., Boston, Mass... *p. 113*

COOLING TOWERS

Bauer Engineering & Contracting Co., Ferd., 4131-37 Meramec St., St. Louis, Mo.

Braun & Co., C. F., 503 Market St., San Francisco, Cal.

Burhorn Co., Edwin (Burhorn), 71 Wall St., New York

Cooling Tower Co., 15 John St., New York

Hart Jr. Co., Franklin B., 50 Church St., New York

Ruemmel-Dawley Mfg. Co., 3900 Chouteau Ave., St. Louis, Mo.

Seymour, Jr., J. M., 51-53 Lawrence St., Newark, N. J.

Stocker, George J., St. Louis, Mo.

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J... *p. 116*

Wheeler Mfg. Co., C. H., Philadelphia, Pa.

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York... *pp. 30, 117, 431, 447*

Zellweger & Sons, J., Adelaide Ave., St. Louis, Mo.

COOPERS' MACHINERY

Strait Mfg. Co., H. N., Kansas City, Mo.

COPING MACHINES

Ham Co., L. M., 150 Portland St., Boston, Mass.

LONG & ALLSTATTER CO., Hamilton, O... *p. 309*

COPPER**—Drawn**

*ROEBLING'S SONS CO., JOHN A., Trenton, N. J... *p. 281*

—Electrolytic

United States Smelting Co., Inc., 120 Broadway, New York

—Sheet

AMERICAN BRASS CO., Waterbury, Conn... *p. 295*

New Haven Copper Co., Seymour, Conn.

Taunton-New Bedford Copper Co., Taunton, Mass.

COPPER CONVERTING MACHINERY

ALLIANCE MACHINE CO., Alliance, O... *p. 264*

COPPER SCRAPING MACHINES

*POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md... *pp. 196, 197*

COPPER WIRES AND CABLES

(See Wire and Cables, Electrical)

COPPER WORK

BADGER & SONS CO., E. B., Boston, Mass... *p. 159*

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 494*

Lawrence & Co., L., 290 Halsey St., Newark, N. J.

Oats & Son, Jos., 232 Quarry St., Philadelphia, Pa.

Philadelphia Coppersmithing Co., 222-226 N. Front St., Philadelphia, Pa.

CORE MAKING MACHINERY

Brown Specialty Machinery Co., 2424 W. 22nd St., Chicago, Ill.

Grimes Molding Machine Co., 1218 Hastings St., Detroit, Mich.

WOODISON CO., E. J., Detroit, Mich... *p. 463*

CORK BOARD

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

CORRUGATING MACHINERY

Robinson Mfg. Co., J. M., Cincinnati, O.

COTTON MACHINERY

Carver Cotton Gin Co., East Bridgewater, Mass.

Curtis & Marble Machine Co., 78 Cambridge St., Worcester, Mass.

Liddell Co., Charlotte, N. C.

Lummus Cotton Gin Sales Co., Dallas, Tex.

Saco-Loell Shops, 77 Franklin St., Boston, Mass.

Whitin Machine Works, Whitinville, Mass.

COUNTERBORES

Advance Tool Co., Cincinnati, O.

Alvord Reamer & Tool Co., Millersburg, Pa.

CLEVELAND TWIST DRILL CO., Cleveland, O... *p. 378*

Clough, R. M., Meridan, Conn.

Davidson Tool Mfg. Corp'n, 120-124 Maiden Lane, New York

Gale-Sawyer Co., 33 Wormwood St., Boston, Mass.

HALL MFG. CO., Abington, Mass... *p. 379*

NATIONAL TOOL CO., Cleveland, O... *p. 383*

COUNTERS**—Automatic**

BROWN INSTRUMENT CO., Philadelphia, Pa... *p. 531*

DURANT MFG. CO., Milwaukee, Wis... *p. 540*

International Register Co., 15 S. Throop St., Chicago, Ill.

Redington & Co., F. B., 112 S. Sangamon St., Chicago, Ill.

Root Co., C. J., Bristol, Conn.

Veeder Mfg. Co., 20 Sargent St., Hartford, Conn.

—Lineal Measure

BROWN INSTRUMENT CO., Philadelphia, Pa... *p. 531*

DURANT MFG. CO., Milwaukee, Wis... *p. 540*

—Revolution

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*

Ashcroft Mfg. Co., 119 W. 40th St., New York

BRISTOL CO., Waterbury, Conn... *p. 530*

BROWN INSTRUMENT CO., Philadelphia, Pa... *p. 531*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*

DURANT MFG. CO., Milwaukee, Wis... *p. 540*

Durbrow & Hearne Mfg. Co., 12 Wooster St., New York

Hart Mfg. Co., R. A., Battle Creek, Mich.

*FOXBORO CO., INC., Foxboro, Mass... *p. 533*

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... *pp. 127, 528*

National Gauge Co., 300 Pacific St., Brooklyn, N. Y.

Root Co., C. J., Bristol, Conn.

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... *p. 534*

COUNTERSHAFTS

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 490*

*BUILDERS IRON FOUNDRY, Providence, R. I... *p. 520*

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*

CLEVELAND TWIST DRILL CO., Cleveland, O... *p. 378*

Clizbe Bros. Mfg. Co., Plymouth, Ind.

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... *pp. 202, 203, 204, 205, 206*

Hannifin Mfg. Co., Chicago, Ill.

*HILL CLUTCH CO., Cleveland, O... *p. 208*

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... *p. 194*

Partridge, E. O., 2047-2049 W. Lake St., Chicago, Ill.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp. 258, 259, 260*

*WOOD'S SONS CO., T. B., Chambersburg, Pa... *pp. 212, 213*

Coo

COUNTERSINKS

CLEVELAND TWIST DRILL CO., Cleveland, O...*p. 378*

COUPLINGS**—Compression**

DOLE VALVE CO., 208 N. Wells St., Chicago, Ill...*p. 141*

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.

—Flexible (Shaft)

Bond Co., Charles, 520 Arch St., Philadelphia, Pa.

Bruce-MacBeth Engine Co., Cleveland, O.

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill...*p. 250*

Columbian Bronze Corp'n, 50 Church St., N. Y. City

DODGE SALES & ENGINEERING CO., Mishawaka, Ind...*pp. 202, 203, 204, 205, 206*

FALK CO., Milwaukee, Wis...*pp. 188, 189*

*FAWCUS MACHINE CO., Pittsburgh, Pa...*pp. 190, 191*

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp. 20, 21, 521*

*JAMES MFG. CO., D. O., 1118-24 W. Monroe St., Chicago, Ill...*pp. 192, 193*

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill...*p. 194*

Meriam Co., 8405 Detroit Ave., Cleveland, O.

NUTTALL CO., R. D., Pittsburgh, Pa...*p. 195*

Smith-Serrell Co., Inc., 88 West St., New York

Thomas Coupling Co., Troy, Pa.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa...*pp. 114, 115*

*WOOD'S SONS CO., T. B., Chambersburg, Pa...*pp. 212, 213*

—Friction Clutch

(See Clutches, Friction)

—Pipe

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y...*p. 140*

BYERS CO., A. M., Pittsburgh, Pa...*p. 154*

CORBIN SCREW CORP'N, New Britain, Conn...*p. 403*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*

Dart Mfg. Co., E. M., 136 Clifford St., Providence, R. I.

HOPE ENGINEERING & SUPPLY CO., Mt. Vernon, O...*p. 32*

Jefferson Union Co., Lexington, Mass.

MALLEABLE IRON FITTINGS CO., Branford, Conn...*p. 157*

New Haven Screw Co., 191-193 Foster St., New Haven, Conn.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa...*pp. 132, 133*

SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*

Stoddard Union Co., Lockport, N. Y.

WILFERT CO., JOHN, 258 Broadway, New York...*pp. 136, 137*

—Shaft

AMERICAN TOOL & MACHINE CO., Boston, Mass...*p. 490*

Bliss & Laughlin, Inc., Harvey, Ill.

Bond Co., Charles, 520 Arch St., Philadelphia, Pa.

Bond Foundry & Machine Co., Manheim, Pa.

*BROWN CO., A. & F., 79 Barclay St., New York...*p. 187*

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky...*p. 201*

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill...*p. 250*

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis...*pp. 118, 119*

Cumberland Steel Co., Cumberland, Md.

DODGE SALES & ENGINEERING CO., Mishawaka, Ind...*pp. 202, 203, 204, 205, 206*

*FALLS CLUTCH & MACHINERY CO., Cuyahoga Falls, O...*p. 207*

*HILL CLUTCH CO., Cleveland, O...*p. 208*

Hilliard Clutch & Machinery Co., Elmira, N. Y.

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill...*p. 194*

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill...*p. 256*

Medart Patent Pulley Co., St. Louis, Mo.

Nicholson & Co., W. H., Wilkes-Barre, Pa.

*ROYERSFORD FOUNDRY & MACHINE CO., 52 N. 5th St., Philadelphia, Pa...*pp. 228, 229*

Stuart Foundry & Machine Works, R. J. & T. H., New Hamburg, N. Y.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill...*pp. 258, 259, 260*

*WOOD'S SONS CO., T. B., Chambersburg, Pa...*pp. 212, 213*

—Union

(See Unions)

—Universal Joint

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky...*p. 201*

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill...*p. 250*

DODGE SALES & ENGINEERING CO., Mishawaka, Ind...*pp. 202, 203, 204, 205, 206*

*WOOD'S SONS CO., T. B., Chambersburg, Pa...*pp. 212, 213*

COVERINGS**—Boiler Blowing**

Woolson, Orosco C., 39 Cortlandt St., New York

—Magnesia

Illinois Fire Proof Covering Co., Inc., 216 W. Kinzie St., Chicago, Ill.

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York...*p. 162*

Kearney Co., Robert A., 445 West St., New York

*MAGNESIA ASSOCIATION OF AMERICA, 721 Bulletin Bldg., Philadelphia, Pa...*pp. 164, 165*

Nightingale & Childs Co., 205 Congress St., Boston, Mass.

—Pipe and Tank

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Central Asbestos & Magnesia Co., 214-216 W. Grand Ave., Chicago, Ill.

Hartford Covering Co., 1234 Main St., Hartford, Conn.

Illinois Fire Proof Covering Co., Inc., 216 W. Kinzie St., Chicago, Ill.

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York...*p. 162*

National Air Cell Covering Co., 163-93 Henderson St., Jersey City, N. J.

—Pulley

GOODRICH RUBBER CO., B. F., Akron, O...*pp. 183, 242*

Gripwell Pulley Covering Co., 157 Cedar St., New York

Peerless Belting Co., Gardenville Station, Buffalo, N. Y.

—Steam Pipe

Acme Asbestos Covering & Supply Co., 407 N. Ada St., Chicago, Ill.

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y...*p. 140*

Aycock Co., R. V., 1702 Grand Ave., Kansas City, Mo.

CAREY CO., PHILIP, Cincinnati, O...*pp. 164, 165*

EHRET MAGNESIA MFG. CO., Valley Forge, Pa...*pp. 164, 165*

Fibre Cell Asbestos Mfg. Co., 407-409 S. Clinton St., Chicago, Ill.

FRANKLIN MFG. CO., Franklin, Pa...*pp. 164, 165*

Hartford Covering Co., 1234 Main St., Hartford, Conn.

Illinois Fire Proof Covering Co., Inc., 216 W. Kinzie St., Chicago, Ill.

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York...*p. 162*

Kearney Co., Robert A., 445 West St., New York

Cov

COVERINGS (Continued)**—Steam Pipe**

KEASBEY & MATTISON CO., Ambler, Pa.
pp. 164, 165

*MAGNESIA ASSOCIATION OF AMERICA,
721 Bulletin Bldg., Philadelphia, Pa... pp.
164, 165

National Air Cell Covering Co., 163-193 Hender-
son St., Jersey City, N. J.

Nightingale & Childs Co., 205 Congress St.,
Boston, Mass.

Norristown Magnesia & Asbestos Co., Norristown,
Pa.

Richards Mfg. Co., 325 Scribner Ave., Grand
Rapids, Mich.

Ric-Wil Co., 522 Guardian Bldg., Cleveland, O.
Standard Asbestos Mfg. Co., Chicago, Ill.

WYCKOFF & SON CO., A., Elmira, N. Y... p.
163

CRANES**—Electric Traveling**

ALLIANCE MACHINE CO., Alliance, O... p.
264

Box & Co., Alfred, Front & Poplar Sts., Phila-
delphia, Pa.

Browning & Co., Victor R., 17701 Lake Shore
Blvd., Cleveland, O.

Cameron Engineering Co., East Stroudsburg,
Pa.

Cleveland Crane & Engineering Co., Wickliffe, O.
Dominion Bridge Co., Ltd., Montreal, P. Q.,
Canada.

Erie Steel Construction Co., Erie, Pa.
Euclid Crane & Hoist Co., Euclid, O.

Granger Co., A. D., 15 Park Row, New York
Hay's Sons, Sam'l W., 6907 Phipps Power Bldg.,
Pittsburgh, Pa.

Kinney, J. N., 30 Church St., New York
Lane Mfg. Co., Montpelier, Vt.

Manning, Maxwell & Moore, Inc., 119 W.
40th St., New York

Maris Bros., 56th & Gray's Ave., Philadelphia,
Pa.

Milwaukee Electric Crane & Mfg. Co., Mil-
waukee, Wis.

Morgan Engineering Co., Alliance, O.
Morris Crane & Hoist Co., Ltd., Herbert,
Niagara Falls, Canada.

NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273

NILES-BEMENT-POND CO., 111 Broadway,
New York... p. 344

Northern Crane Works, Ltd., Walkerville, Ont.,
Canada

Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger, Milwaukee, Wis.

Pittsburgh Crane & Equipment Co., Pittsburgh,
Pa.

Ricker Mfg. Co., Rochester, N. Y.
Roeper Crane & Hoist Works, 1729-1745 Moss
St., Reading, Pa.

San Francisco Engineering Co., 322-324 6th St.,
San Francisco, Cal.

Scully-Jones Co., Chicago, Ill.

*SHEPARD ELECTRIC CRANE & HOIST
CO., Montour Falls, N. Y... pp. 274, 275

Stamp & Co., Charles E., Cleveland, O.
Toledo Bridge & Crane Co., Toledo, O.

Whiting Foundry Equipment Co., Harvey, Ill.

—Floor (Portable)

BROWN PORTABLE CONVEYING MA-
CHINERY CO., Chicago, Ill... p. 262

Canton Foundry & Machine Co., Canton, O.
*BROWN HOISTING MACHINERY CO.,
Cleveland, O... p. 265

*CLYDE IRON WORKS, 29th Ave. W. &
Michigan St., Duluth, Minn... p. 268

Keystone Garage Equipment Co., 204 Devon-
shire St., Boston, Mass.

Milton & Son, S. G., Franklin, Pa.
Soper, George E. (Hercules), Kankakee, Ill.

—Gantry

ALLIANCE MACHINE CO., Alliance, O... p.
264

Cleveland Crane & Engrg. Co., Wickliffe, O.

*BROWN HOISTING MACHINERY CO.,
Cleveland, O... p. 265

*CLYDE IRON WORKS, 29th Ave. & Michi-
gan St., Duluth, Minn... p. 268

Erie Steel Construction Co., Erie, Pa.
INDUSTRIAL WORKS, Bay City, Mich... pp.
266, 267

*LINK-BELT CO., 39th St. & Western Ave.,
Chicago, Ill... p. 256

NILES-BEMENT-POND CO., 111 Broadway,
New York... p. 344

Northern Engineering Works, Detroit, Mich.
Toledo Bridge & Crane Co., Toledo, O.

WELLMAN-SEAVER-MORGAN CO., 7000
Central Ave., Cleveland, O... p. 272

—Hand Power

Box & Co., Alfred, Front & Poplar Sts., Phila-
delphia, Pa.

*BROWN HOISTING MACHINERY CO.,
Cleveland, O... p. 265

Chisholm & Moore Mfg. Co., Lakeside Ave. &
E. 49th St., Cleveland, O.

COBURN TROLLEY TRACK MFG. CO.,
Holyoke, Mass... p. 276

Erie Steel Construction Co., Erie, Pa.
Euclid Crane & Hoist Co., Euclid, O.

Hay's Sons, Sam'l W., 6907 Phipps Power Bldg.,
Pittsburgh, Pa.

Maris Bros., 56th St. & Gray's Ave., Philadel-
phia, Pa.

Milton & Son, S. G. (Champion), Franklin, Pa.
Morris Crane & Hoist Co., Ltd., Herbert,
Niagara Falls, Canada

NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273

NILES-BEMENT-POND CO., 111 Broadway,
New York... p. 344

Northern Engineering Works, Detroit, Mich.
Pittsburgh Crane Equipment Co., Pittsburgh,
Pa.

Ricker Mfg. Co., Rochester, N. Y.
Roeper Crane & Hoist Works, 1729-1745 Moss
St., Reading, Pa.

Speidel, J. G., Reading, Pa.
Stamp & Co., Charles E., Cleveland, O.

Yale & Towne Mfg. Co., 9 E. 40th St., New
York

—**Hydraulic**

ALLIANCE MACHINE CO., Alliance, O... p.
264

SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa... p.
456

WATSON-STILLMAN CO., 35 Church St.,
New York... p. 457

WOOD & CO., R. D., Philadelphia, Pa... p. 458

—Jib

ALLIANCE MACHINE CO., Alliance, O... p.
264

*BROWN HOISTING MACHINERY CO.,
Cleveland, O... p. 265

Cameron Engineering Co., Stroudsburg, Pa.
*CLYDE IRON WORKS, 29th Ave. W. &
Michigan St., Duluth, Minn... p. 268

INDUSTRIAL WORKS, Bay City, Mich... pp.
266, 267

Lakeside Bridge & Steel Co., North Milwaukee,
Wis.

NEW JERSEY FOUNDRY & MACHINE CO.,
88 West St., New York... p. 273

NILES-BEMENT-POND CO., 111 Broadway,
New York... p. 344

Parker, S. E., 1800 N. Francisco Ave., Chicago,
Ill.

*SHEPARD ELECTRIC CRANE & HOIST
CO., Montour Falls, N. Y... pp. 274, 275

—Locomotive

American Hoist & Derrick Co., St. Paul, Minn.
*BALL ENGINE CO., Erie, Pa... p. 16

*BROWN HOISTING MACHINERY CO.,
Cleveland, O... p. 265

Browning Co., Cleveland, O.
Browning & Co., Victor R., 17701 Lake Shore
Blvd., Cleveland, O.

Byers Machine Co., John F., Ravenna, O.

Cov

Carroll Foundry & Machine Co., Bucyrus, O.
Davenport Locomotive Works, Davenport,
Iowa

Dravo Contracting Co., Engineering Works
Dep't., Pittsburgh, Pa.
Exeter Machine Works, Pittston, Pa.
INDUSTRIAL WORKS, Bay City, Mich...*pp.*
266, 267

Kinney, J. N., 30 Church St., New York
*LINK-BELT CO., 39th St. & Stewart Ave.,
Chicago, Ill...*p.* 256

McMyler Interstate Co., Bedford, O.
Ohio Locomotive Crane Co., Bucyrus, O.
Orton & Steinbrenner, 608 S. Dearborn St.,
Chicago, Ill.
Osgood Co., Marion, O.

—Pillar

*BROWN HOISTING MACHINERY CO.,
Cleveland, O...*p.* 265

INDUSTRIAL WORKS, Bay City, Mich...*pp.*
266, 267

Northern Engineering Works, Detroit, Mich.

—Pneumatic

Curtis Pneumatic Machinery Co., St. Louis, Mo.
Detroit Hoist & Machine Co., Detroit, Mich.
Stamp & Co., Charles E., Cleveland, O.

—Portable

Northern Engineering Works, Detroit, Mich.
Bay City Foundry & Machine Co., 26th &
Water Sts., Bay City, Mich.

*BROWN HOISTING MACHINERY CO.,
Cleveland, O...*p.* 265

BROWN PORTABLE CONVEYING MA-
CHINERY CO., Chicago, Ill...*p.* 262

Soper, George E. (Hercules), Kankakee, Ill.
United Engine & Mfg. Co., Hanover, Pa.

—Shipyard

Dravo Contracting Co., Engineering Works
Dept., Pittsburgh, Pa.

Heyl & Patterson, Inc., Pittsburgh, Pa.
Kinney, J. N., 30 Church St., New York
Lakeside Bridge & Steel Co., North Milwaukee,
Wis.

McMyler Interstate Co., Bedford, O.
WELLMAN-SEAVER-MORGAN CO., 7000
Central Ave., Cleveland, O...*p.* 272

—Wrecking

Carroll Foundry & Machine Co., Bucyrus, O.
INDUSTRIAL WORKS, Bay City, Mich...*pp.*
266, 267

CRANK PIN TURNING MACHINES

Hartford Engine Works, 223 State St., Hartford,
Conn.

Rooksby & Co., E. J., 435 N. Eleventh St.,
Philadelphia, Pa.

CRANKS, BALL

CINCINNATI BALL CRANK CO., Cin-
cinnati, O...*p.* 398

CINCINNATI SCREW CO., Twilight, O.
(Cincinnati Suburb)...*p.* 402

WILLIAMS & CO., J. H., 70 Richards St.,
Brooklyn, N. Y...*p.* 397

CRANKSHAFTS

Erie Forge Co., Erie, Pa.
Leard Co., Wm. E., 16th St. & 5th Ave., New
Brighton, Pa.

Moltrup Steel Products Co., Beaver Falls, Pa.
PENNSYLVANIA FORGE CO., Bridesburg,
Philadelphia, Pa...*p.* 158

Standard Gauge Steel Co., Beaver Falls, Pa.
Tindel-Morris Co., Eddystone, Pa.

UNION DROP FORGE CO., 358 W. Grand
Ave., Chicago, Ill...*p.* 302

VULCAN STEAM FORGING CO., 247 Rano
St., Buffalo, N. Y...*p.* 303

WILLIAMS & CO., J. H., 70 Richards St.,
Brooklyn, N. Y...*p.* 397

WILLIAMS, WHITE & CO., Moline, Ill...*p.*
314

CRUCIBLES

—Graphite

Dixon Crucible Co., Joseph, Jersey City, N. J.

McCullough-Dalzell Crucible Co., 36th St.,
Pittsburgh, Pa.

Seidel, Inc., R. B., 1322 Callowhill St., Phila-
delphia, Pa.

WOODISON CO., E. J., Detroit, Mich...*p.*
463

—Plumbago

Ross-Tacony Crucible Co., Tacony, Pa.

CRUSHER PARTS

American Manganese Steel Co., 1850 Mc-
Cormick Bldg., Chicago, Ill.

CRUSHERS

—Coal

Aero Pulverizer Co., 120 Broadway, New York
BARTLETT & SNOW CO., C. O., Cleveland,
O...*p.* 249

FARNHAM MFG. CO., 31-39 Indiana St.,
Buffalo, N. Y...*p.* 277

*FULLER-LEHIGH CO., Fullerton, Pa...*p.* 92

*HUNT CO., INC., C. W., West New Brighton,
Staten Island, N. Y...*pp.* 252, 253

*LINK-BELT CO., 39th St. & Stewart Ave.,
Chicago, Ill...*p.* 256

*LOCOMOTIVE PULVERIZED FUEL CO.,
30 Church St., New York...*p.* 93

Orton & Steinbrenner, 608 S. Dearborn St.,
Chicago, Ill.

Pennsylvania Crusher Co., Stephen Girard
Bldg., Philadelphia, Pa.

ROBINS CONVEYING BELT CO., Park Row
Bldg., New York...*p.* 257

Scottdale Machine & Mfg. Co., Scottdale, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.

STROUD & CO., E. H., 928-934 Fullerton Ave.,
Chicago, Ill...*pp.* 466, 467

*WILLIAMS PATENT CRUSHER & PUL-
VERIZER CO., Old Colony Bldg., Chicago,
Ill...*pp.* 468, 469

*WORTHINGTON PUMP & MACHINERY
CORP'N, 115 Broadway, New York...*pp.*
30, 117, 431, 447

Cr

—Disc

CHALMERS & WILLIAMS (Symons), 1450
Arnold St., Chicago Heights, Ill...*p.* 465

—Hammer

BARTLETT & SNOW CO., C. O., Cleveland,
O...*p.* 249

K-B Pulverizer Co., Inc., 86 Worth St., New York

*WILLIAMS PATENT CRUSHER & PUL-
VERIZER CO., Old Colony Bldg., Chicago,
Ill...*pp.* 468, 469

—Jaw

CHALMERS & WILLIAMS, 1450 Arnold St.,
Chicago Heights, Ill...*p.* 465

Universal Road Machinery Co., Kingston, N. Y.

*WILLIAMS PATENT CRUSHER & PUL-
VERIZER CO., Old Colony Bldg., Chicago,
Ill...*pp.* 468, 469

*WORTHINGTON PUMP & MACHINERY
CORP'N, 115 Broadway, New York...*pp.*
30, 117, 431, 447

—Ore and Rock

*ALLIS-CHALMERS MFG. CO., Milwaukee,
Wis...*p.* 15

BARTLETT & SNOW CO., C. O., Cleveland,
O...*p.* 249

Buchanan Co., C. G., Inc., 90 West St., New
York

CHALMERS & WILLIAMS, 1450 Arnold St.,
Chicago Heights, Ill...*p.* 465

Good Roads Machinery Co., Fort Wayne, Ind.

Johnson Engineering Works, First National
Bank Bldg., Chicago, Ill.

Sturtevant Mill Co., Harrison Sq., Boston, Mass.

*WORTHINGTON PUMP & MACHINERY
CORP'N, 115 Broadway, New York...*pp.* 30,
117, 431, 447

—Roll

BARTLETT & SNOW CO., C. O., Cleveland,
O...*p.* 249

FARNHAM MFG. CO., 31-39 Indiana St.,
Buffalo, N. Y.

CRUSHERS (Continued)

—Roll

*FULLER-LEHIGH CO., Fullerton, Pa. . . p. 92

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y. . . pp. 252, 253

*LINK-BELT CO., 30th St. & Stewart Ave., Chicago, Ill. . . p. 256

McLanahan-Stone Machine Co., Hollidaysburg, Pa.

Pennsylvania Crusher Co., Stephen Girard Bldg., Philadelphia, Pa.

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . pp. 466, 467

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York. . . pp. 30, 117, 431, 447

—Salt

WILLCOX ENGINEERING CO., Saginaw, Mich. . . p. 516

—Wood Pulp

Carthage Machine Co., Carthage, N. Y.

*WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill. . . pp. 468, 469

CRUSHING AND GRINDING MACHINERY

Abbe Engrg. Co., 220 Broadway, New York

*ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. . . p. 15

American Clay Mch. Co., Bucyrus, O.

BARTLETT & SNOW CO., C. O., Cleveland, O. . . p. 249

Braun Corp'n, Los Angeles, Cal.

CHALMERS & WILLIAMS, 1450 Arnold St., Chicago Heights, Ill. . . p. 465

CHAMBERS BROS. CO., Philadelphia, Pa. . . p. 480

*FULLER-LEHIGH CO., Fullerton, Pa. . . p. 92

Gruender Patent Crusher & Pulverizer Co., 924 N. First St., St. Louis, Mo.

K-B Pulverizer Co., Inc., 86 Worth St., New York

Pennsylvania Crusher Co., Stephen Girard Bldg., Philadelphia, Pa.

Phillips & McLaren, 24th & Smallman Sts., Pittsburgh, Pa.

Smidth & Co., F. L., 50 Church St., New York

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . pp. 466, 467

Sturtevant Mill Co., Harrison Sq., Boston, Mass.

Traylor Engrg. & Mfg. Co., Allentown, Pa.

*WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill. . . pp. 468, 469

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York. . . pp. 30, 117, 431, 447

—Sugar Cane

Honolulu Iron Works Co., Honolulu, T. H.

CRYSTALLIZERS

—Salt

WILLCOX ENGINEERING CO., Saginaw, Mich. . . p. 516

—Sugar

Kilby Mfg. Co., Cleveland, O.

PHOENIX IRON WORKS CO., Meadville, Pa. . . p. 497

Turl Iron & Car Co., Inc., 50 Broad St., New York

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn. . . p. 64

CUPOLAS, FOUNDRY

Whiting Foundry Equipment Co., Harvey, Ill.

—Tilting

Ross, George A., 1951 W. Madison St., Chicago, Ill.

CUPS, OIL AND GREASE

(See Oil and Grease Cups)

CUTTERS

—Bar

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

—Boiler Tube

Faessler Mfg. Co., J., Moberly, Mo.

LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373

Redington & Co., F. B., 112 S. Sangamon St., Chicago, Ill.

Salisbury Foundry & Machine Co., Salisbury, Md.

Union Machine Co., 183 University Ave., St. Paul, Minn.

—Bolt

Brown Co., H. B., East Hampton, Conn.

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass. . . pp. 374, 375

LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373

NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344

WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O. . . p. 365

Williams Tool Co., Erie, Pa.

—Gang, Slitting

Tinker & Sons Co., F., Pittsburgh, Pa.

—Gauge Glass

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa. . . pp. 127, 528

—Gear

Clough, R. M., Meriden, Conn.

*FELLOWS GEAR SHAPER CO., Springfield, Vt. . . p. 349

—Gear and Formed

NATIONAL TOOL CO., Cleveland, O. . . p. 383

—Milling

Advance Tool Co., Cincinnati, O.

Alvord Reamer & Tool Co., Millersburg, Pa.

Barbar-Colman Co., Rockford, Ill.

BECKER MILLING MACHINE CO., Hyde Park, Boston, Mass. . . p. 352

*BILTON MACHINE TOOL CO., Bridgeport, Conn. . . p. 353

Brown & Sharpe Mfg. Co., Promenade St., Providence, R. I.

Cleveland Milling Machine Co., 18511 Euclid Ave., Cleveland, O.

Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

Davidson Tool Mfg. Corp'n, 120-124 Maiden Lane, New York

Detroit Reamer & Tool Co., 302 Congress St., East, Detroit, Mich.

Gale-Sawyer Co., 33 Wormwood St., Boston, Mass.

Goddard Tool Co., 351 W. Chicago Ave., Chicago, Ill.

Illinois Tool Works, 154-166 E. Erie St., Chicago, Ill.

Ingersoll Milling Machine Co., Rockford, Ill.

Lincoln Twist Drill Co., Taunton, Mass.

McCarthy Drill & Tool Corp'n, 30 Church St., New York

Mergenthaler Co., Baltimore, Md.

NATIONAL TOOL CO., Cleveland, O. . . p. 383

National Twist Drill & Tool Co., Brush near Boulevard, Detroit, Mich.

Standard Tool Co., 6900 Central Ave., Cleveland, O.

Union Twist Drill Co., Athol, Mass.

WHITNEY MFG. CO., Hartford, Conn. . . p. 367

Winchester Repeating Arms Co., New Haven, Conn.

—Pipe

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass. . . pp. 374, 375

LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373

MARK MFG. CO., P. O. Box G, Chicago, Ill. . . p. 160

NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344

Reed Mfg. Co., Erie, Pa.

Saunders' Sons, Inc., D., 21 Atherton St., Yonkers, N. Y.

Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo, O.

Trimont Mfg. Co. (Trimo), Roxbury, Boston, Mass.

—Sheet Metal

Savage Co., W. J., Knoxville, Tenn.

—Sprue

Tessmer Machine & Tool Co., 285-91 Rivard St., Detroit, Mich.

TOLEDO MACHINE & TOOL CO., Toledo, O...*p.* 313

—Thread

Rivett Lathe & Grinder Co., Brighton, Boston, Mass.

CUTTING APPARATUS

—Oxy-Acetylene

Cox Brass Mfg. Co., Albany, N. Y.

Imperial Brass Mfg. Co. (Imperial), 1200 W. Harrison St., Chicago, Ill.

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J...*p.* 421

—Oxy-Hydrogen

Burdett Mfg. Co., 309 St. Johns Court, Chicago, Ill.

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J...*p.* 421

—Oxy-Pintsch

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York...*p.* 505

CUTTING MACHINES (Paper, Cloth, Leather, etc.)

Dexter Folder Co., 200 5th Ave., New York

Oswego Machine Works, Oswego, N. Y.

CUTTING-OFF MACHINES

—Abrasive

Gilman & Son, Springfield, Vt.

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass...*pp.* 374, 375

Peter Brothers' Mfg. Co., Algonquin, Ill.

—Cold-Saw

Cochrane-Bly Co., Rochester, N. Y.

Davis Machine Tool Co., Inc., 305 St. Paul St., Rochester, N. Y.

Earle Gear & Machine Co. (Lea Simplex), Stenton & Wyoming Aves., Wayne Junction, Philadelphia, Pa.

Espen-Lucas Machine Works, Front & Girard Ave., Philadelphia, Pa.

Gorton Machine Co., George, Racine, Wis.

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass...*pp.* 374, 375

Ham Co., L. M., 150 Portland St., Boston, Mass.

LYND-FARQUHAR CO., Boston, Mass...*p.* 348

Matson Machine Co., Concord, N. H.

Newton Machine Tool Works, Inc., 23rd & Vine Sts., Philadelphia, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York...*p.* 344

Racine Tool & Machine Co. (Racine), Racine, Wis.

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa...*p.* 456

—Hack

ATKINS & CO., INC., E. C., Indianapolis, Ind...*p.* 385

CYLINDERS

—Furnace

LYNCHBURG FOUNDRY CO., 816 Peoples Gas Bldg., Chicago, Ill...*p.* 156

—Gas

BLAW-KNOX CO. (Knox), Pittsburgh, Pa...*p.* 489

Tindel-Morris Co., Eddystone, Pa.

—Pump

MARK MFG. CO., P. O. Box G, Chicago, Ill...*p.* 160

CYLINDERS REBORED

Baker Valve Co., Box 1772, Minneapolis, Minn.

Hartford Engine Works, 223 State St., Hartford, Conn.

*LAMBERT & MANN CO., Wood & Walnut Sts., Chicago, Ill...*p.* 448

Watertown Engine & Machine Co., Watertown, N. Y.

Wendland Engineering & Construction, C. F., 63 Wooster St., New York

D

DAIRY MACHINERY

Ann Arbor Machine Co., Ann Arbor, Mich.

Associated Manufacturers Co., Waterloo, Ia.

Dairy Machinery & Construction Co., Derby, Conn.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J...*p.* 494

PFAUDLER CO., Rochester, N. Y...*p.* 490

Rice and Adams Corp'n, Buffalo, N. Y.

Rutland Mfg. Co., Inc., Forest, West & Pine Sts., Rutland, Vt.

DAMPER REGULATORS

(See Regulators, Damper)

DEHUMIDIFYING APPARATUS

AMERICAN BLOWER CO., Detroit, Mich...*pp.* 434, 435

BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa...*p.* 470

Carrier Air Conditioning Co., Buffalo, N. Y.

CARRIER ENGINEERING CORP'N, 39 Cortlandt St., New York...*p.* 471

Cramer, Stuart W., Charlotte, N. C.

DEMAGNETIZERS

D & W FUSE CO., Providence, R. I...*p.* 393

DERRICKS AND DERRICK FITTINGS

American Hoist & Derrick Co., St. Paul, Minn.

Bergen Point Iron Works, Foot W. 5th St., Bayonne, N. J.

Buffalo Contractors Plant Corp'n, 129 Erie St., Buffalo, N. Y.

Byers Machine Co., John F., Ravenna, O.

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn...*p.* 268

Horton Co., John T., 242 Bradhurst Ave., New York

Insley Mfg. Co., E. St. Clair & Onley Sts., Indianapolis, Ind.

*LIDGERWOOD MFG. CO., 96 Liberty St., New York...*p.* 271

Parker, S. E., 1800 N. Francisco Ave., Chicago, Ill.

Shannon & Co., J. Jacob, 1744 Market St., Philadelphia, Pa.

Superior Iron Works Co., Superior, Wis.

Whitehead & Kales Iron Works, Beecher Ave. & M. C. R. R., Detroit, Mich.

DESTRUCTORS, REFUSE

Borge Incinerator Corp'n, 1216 Flatiron Bldg., New York

Decarie Incinerator Co., 817 McKnight Bldg., Minneapolis, Minn.

Harris Incinerators—Steam Generator Co., 65 Life & Casualty Bldg., Nashville, Tenn.

JARVIS ENGINEERING CO., 261 Franklin St., Boston, Mass...*p.* 502

Kewanee Boiler Co. (Kewanee), Kewanee, Ill.

Kutztown Foundry & Machine Co., 1421 Chestnut St., Philadelphia, Pa.

WASHBURN & GRANGER, 50 Church St., New York...*p.* 91

DIAL ATTACHMENTS (For Beam Scales)

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York...*p.* 513

DIAMONDS (For Mechanical Purposes)

Desmond-Stephan Mfg. Co., Urbana, O.

Dessau, S. Maurice, 6 Maiden Lane, New York

DIAPHRAGMS, RUBBER

Continental Rubber Works, Erie, Pa.

DIE CASTINGS

(See Castings, Die Molded)

DIE CUTTING

HOGGSON & PETTIS MFG. CO., New Haven Conn...*pp.* 394, 395, 396

Die

DIE CUTTING (Continued)

KELLER MECHANICAL ENGRAVING CO.,
68 Washington St., Brooklyn, N. Y. . . *p. 369*
NOBLE & WESTBROOK MFG. CO., Hartford,
Conn. . . *p. 368*

DIE CUTTING MACHINERY

Anderson Die Machine Co., Bridgeport, Conn.
Luster-Jordan Co., Inc., W. Washington St.,
Norristown, Pa.
NILES-BEMENT-POND CO., 111 Broadway,
New York. . . *p. 344*

DIE SINKING MACHINES

Jackson Machine Tool Co., Jackson, Mich.
KELLER MECHANICAL ENGRAVING CO.,
68 Washington St., Brooklyn, N. Y. . . *p. 369*
PRATT & WHITNEY CO., 111 Broadway,
New York. . . *p. 344*
White Dental Mfg. Co., S. S., 211 S. 12th St.,
Philadelphia, Pa.

DIE STOCKS

(See Stocks, and Dies)

DIES**—Blanking**

AKRON METALLIC GASKET CO., 152 N.
Union St., Akron, O. . . *p. 177*
BLISS CO., E. W., 19 Adams St., Brooklyn, N.
Y. . . *pp. 310, 311*
Electric Co., 94 Allyn St., Hartford, Conn.
Globe Machine & Stamping Co., 1254 W. 76th
St., N. W., Cleveland, O.
Lewthwaite Machine Co., T. H., 415 E. 31st
St., New York
McCall Machine Works, Rochester, N. Y.
MEHL MACHINE TOOL & DIE CO., Roselle,
N. J. . . *pp. 376, 377*
SLOCUM, AVRAM & SLOCUM LABORA-
TORIES, INC., 531-537 W. 21st St., New
York. . . *p. 538*
TOLEDO MACHINE & TOOL CO., Toledo,
O. . . *p. 313*
Ulmer Co., J. C., 1791 E. 38th St., Cleveland, O.

Die

—**Cutting (Paper, Cloth and Rubber)**

HOGGSON & PETTIS MFG. CO., New Haven,
Conn. . . *pp. 394, 395, 396*
MEHL MACHINE TOOL & DIE CO., Roselle,
N. J. . . *pp. 376, 377*
SLOCUM, AVRAM & SLOCUM LABORA-
TORIES, INC., 531-537 W. 21st St., New
York. . . *p. 538*
TOLEDO MACHINE & TOOL CO., Toledo,
O. . . *p. 313*
V & O Press Co., Glendale, L. I., N. Y.

—Drawing

Bryant Chucking Grinder Co., Springfield, Vt.
Robbins, Gamwell & Co., Pittsfield, Mass.
Winchester Repeating Arms Co., New Haven,
Conn.

—Forging

KELLER MECHANICAL ENGRAVING CO.,
68 Washington St., Brooklyn, N. Y. . . *p. 369*
Pittsburgh Iron & Steel Foundries Co., 314 Oliver
Bldg., Pittsburgh, Pa.
Winchester Repeating Arms Co., New Haven,
Conn.

—Medal and Coining

KELLER MECHANICAL ENGRAVING CO.,
68 Washington St., Brooklyn, N. Y. . . *p. 369*

—Punching

BLISS CO., E. W., 19 Adams St., Brooklyn, N.
Y. . . *pp. 310, 311*
Lewthwaite Machine Co., T. H., 415 E. 31st
St., New York
MEHL MACHINE TOOL & DIE CO., Roselle,
N. J. . . *pp. 376, 377*
NIAGARA MACHINE & TOOL WORKS,
Buffalo, N. Y. . . *p. 312*
Richards Co., I. P., 23 Pemberton St., Providence,
R. I.
SLOCUM, AVRAM & SLOCUM LABORA-
TORIES, INC., 531-537 W. 21st St., New
York. . . *p. 538*
TOLEDO MACHINE & TOOL CO., Toledo,
O. . . *p. 313*

—Sheet Metal Working

BLISS CO., E. W., 19 Adams St., Brooklyn, N.
Y. . . *pp. 310, 311*
Columbus Die, Tool & Machine Co., Columbus,
O.
Gem Mfg. Co., 1229-43 Goebel St., N. S., Pitts-
burgh, Pa.
Gilro Machine Co., Ft. of 9th Ave., Oakland,
Cal.
Grand Rapids Brass Co., 90 Scribner Ave., N.
W., Grand Rapids, Mich.
KELLER MECHANICAL ENGRAVING CO.,
68 Washington St., Brooklyn, N. Y. . . *p. 369*
Lewthwaite Machine Co., T. H., 415 E. 31st
St., New York
Lincoln Machine Co., Maine & Carver Sts.,
Pawtucket, R. I.
McDonald Machine Co., 32nd & Shields Ave.,
Chicago, Ill.
Maute & Sons, J., 23 Kane St., Buffalo, N. Y.
MEHL MACHINE TOOL & DIE CO., Roselle,
N. J. . . *pp. 376, 377*
NIAGARA MACHINE & TOOL WORKS,
Buffalo, N. Y. . . *p. 312*
Oliver Instrument Co., Adrian, Mich.
Robbins, Gamwell & Co., Pittsfield, Mass.
Robinson Tool Works, Inc., Waterbury, Conn.
SLOAN & CHACE MFG. CO., LTD., Sixth
Ave., Cor. N. 13th St., Newark, N. J. . . *p. 357*
SLOCUM, AVRAM & SLOCUM LABORA-
TORIES, INC., 531-537 W. 21st St., New
York. . . *p. 538*
TOLEDO MACHINE & TOOL CO., Toledo,
O. . . *p. 313*
Urbana Tool and Die Co., Urbana, O.
V & O Press Co., Glendale, L. I., N. Y.
Zenite Metal Co., Indianapolis, Ind.

—**Stamping**

BLISS CO., E. W., 19 Adams St., Brooklyn,
N. Y. . . *pp. 310, 311*
Coleman Far Box Co., Ltd., 1191 Bathurst St.,
Toronto, Canada.
Dodge Tool Co., Grinnell, Ia.
Maute & Sons, J., 23 Kane St., Buffalo, N. Y.
MEHL MACHINE TOOL & DIE CO., Roselle,
N. J. . . *pp. 376, 377*
NIAGARA MACHINE & TOOL WORKS,
Buffalo, N. Y. . . *p. 312*
Owen & Co., E. H., 101 N. Jefferson St., Chicago,
Ill.
Robbins, Gamwell & Co., Pittsfield, Mass.
SLOCUM, AVRAM & SLOCUM LABORA-
TORIES, INC., 531-537 W. 21st St., New
York. . . *p. 538*
TOLEDO MACHINE & TOOL CO., Toledo,
O. . . *p. 313*
Winchester Repeating Arms Co., New Haven,
Conn.
Zenite Metal Co., Indianapolis, Ind.

—**Sub-Press**

BLISS CO., E. W., 19 Adams St., Brooklyn,
N. Y. . . *pp. 310, 311*
Griswold Machine Co., Geo. M., New Haven,
Conn.
MEHL MACHINE TOOL & DIE CO., Roselle,
N. J. . . *pp. 376, 377*
Robbins, Gamwell & Co., Pittsfield, Mass.
Sheffield Machine & Tool Co., Dayton, O.
SLOAN & CHACE MFG. CO., LTD., Sixth
Ave., Cor. N. 13th St., Newark, N. J. . . *p. 357*
TOLEDO MACHINE & TOOL CO., Toledo,
O. . . *p. 313*
Urbana Tool and Die Co., Urbana, O.
Waltham Machine Works, Waltham, Mass.

—**Thread Cutting**

Bay State Tap & Die Co., Mansfield, Mass.
*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill. . . *pp. 120, 121, 122, 123*
*GREENFIELD TAP & DIE CORP'N, Green-
field, Mass. . . *pp. 374, 375*
LANDIS MACHINE CO., INC., Waynesboro,
Pa. . . *pp. 372, 373*
MARK MFG. CO., P. O. Box G, Chicago, Ill.
. . . *p. 160*
MODERN TOOL CO., Erie, Pa. . . *pp. 360, 361*

Advertisements of firms marked * appear in The Journal, A. S. M. E.

NATIONAL ACME CO., Cleveland, O... *pp*
334, 335

PRATT & WHITNEY CO., 111 Broadway,
New York... *p.* 344

Russell Mfg. Co., Greenfield, Mass.

—**Thread Cutting (Self-Opening)**
Eastern Machine Screw Corp'n, New Haven,
Conn.

Errington Mechanical Laboratory, 39 Cortlandt
St., New York

Geometric Tool Co., New Haven, Conn.

*GREENFIELD TAP & DIE CORP'N, Green-
field, Mass... *pp.* 374, 375

Ideal Tool & Mfg. Co., Beaver Falls, Pa.

*JONES & LAMSON MACHINE CO. (Hart-
ness), Springfield, Vt... *pp.* 324, 325, 326, 327

LANDIS MACHINE CO., INC., Waynesboro,
Pa... *pp.* 372, 373

MODERN TOOL CO., Erie, Pa... *pp.* 360, 361

Murphy Machine & Tool Co., 85 Porter St.,
Detroit, Mich.

NATIONAL ACME CO., Cleveland, O... *pp.*
334, 335

Rickert-Shafer Co., 613 W. 11th St., Erie, Pa.

—**Thread Rolling**
Cleveland Die & Mfg. Co., 748 E. 82nd St.,
Cleveland, O.

DIESEL ENGINES
(See Engines, Oil, Diesel)

DIFFERENTIALS, AUTOMOBILE
Frost Gear & Forge Co., Jackson, Mich.

Ganschow Co., Wm., Washington-Morgan St.,
Chicago, Ill.

VAN DORN & DUTTON CO., Cleveland, O...
p. 370

Warner Gear Co., Muncie, Ind.

DIGESTORS
BARTLETT & SNOW CO., C. O., Cleveland,
O... *p.* 249

*BIGELOW CO., 76 River St., New Haven,
Conn... *p.* 40

BLAW-KNOX CO., Pittsburgh, Pa... *p.* 480

*CASEY-HEDGES CO., Chattanooga, Tenn...
pp. 42, 43

*CLYDE IRON WORKS, 29th Ave., W. &
Michigan St., Duluth, Minn... *p.* 268

Dillon Steam Boiler Works, D. M., Fitchburg,
Mass... *pp.* 44, 45

Granger Co., A. D., 15 Park Row, New York

KOVEN & BROTHER, L. O., 154 Ogden Ave.,
Jersey City, N. J... *p.* 494

PFAUDLER CO., Rochester, N. Y... *p.* 400

PHOENIX IRON WORKS CO., Meadville,
Pa... *p.* 497

SWENSON EVAPORATOR CO., 945 Monad-
nock Block, Chicago, Ill... *p.* 501

—**Welded**
American Welding Co., Carbondale, Pa.

BLAW-KNOX CO., Pittsburgh, Pa... *p.* 489

Kellogg Co., M. W., 90 West St., New York

DIGGING MACHINERY
BALL ENGINE CO., Erie, Pa... *p.* 16

Hayward Co., 50 Church St., New York

DIGGING AND RECLAIMING TOWERS
Maine Electric Co., 35 Commercial St., Port-
land, Me.

DIPPING BASKETS
Morse & Whyte Co., Cambridge, Mass.

DISCS
—**Abrasive**
Gardner Machine Co., Beloit, Wis.

—**Friction (High Speed)**
ATKINS & CO., INC., E. C., Indianapolis, Ind.
... *p.* 385

—**Steel**
ATKINS & CO., INC., E. C., Indianapolis,
Ind... *p.* 385

AUBURN BALL BEARING CO., 22 Eliza-
beth St., Rochester, N. Y... *p.* 215

WHELOCK, LOVEJOY & CO., 23 Cliff St.,
New York... *p.* 301

—**Steel (Forged)**

VULCAN STEAM FORGING CO., 247 Rano
St., Buffalo, N. Y... *p.* 303

—**Valve**
AMERICAN VULCANIZED FIBRE CO.,
Wilmington, Del... *p.* 296

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp.* 120, 121, 122, 123

Durabla Mfg. Co., 114 Liberty St., New York

*GOETZE GASKET & PACKING CO., 22
Allen Ave., New Brunswick, N. J... *p.* 180

GOODRICH RUBBER CO., B. F., Akron, O...
pp. 183, 242

La Favorite Rubber Mfg. Co., Paterson, N. J.

Plouff Co., 1500 River St., Boston, Mass.

RICHARDSON-PHENIX CO., 126 Reservoir
Ave., Milwaukee, Wis... *pp.* 170, 171

Victor Balata & Textile Belting Co., 38 Murray
St., New York

Voorhees Rubber Mfg. Co., 18-50 Bostwick
Ave., Jersey City, N. J.

DISINTEGRATING MACHINERY
BARTLETT & SNOW CO., C. O., Cleveland,
O... *p.* 249

*CASEY-HEDGES CO., Chattanooga, Tenn...
pp. 42, 43

Holmes & Blanchard Co., 31 State St., Boston,
Mass.

Stedman's Foundry & Machine Works, Aurora,
Ind.

STROUD & CO., E. H., 928-934 Fullerton Ave.,
Chicago, Ill... *pp.* 466, 467

*WILLIAMS PATENT CRUSHER & PUL-
VERIZER CO., Old Colony Bldg., Chicago,
Ill... *pp.* 468, 469

DISPENSING MACHINERY
Horn & Hardart Baking Co., 21 S. 11th St.,
Philadelphia, Pa.

DISTILLING APPARATUS
BADGER & SONS CO., E. B., Boston, Mass...
p. 159

*DE LA VERGNE MACHINE CO., 1123 E. Doo
138th St., New York... *p.* 28

DuVivier, Ernest H., 30 Church St., New York

*HODGES WATER STILL CO., INC., 1234
Callowhill St., Philadelphia, Pa... *p.* 500

KOVEN & BROTHER, L. O., 154 Ogden Ave.,
Jersey City, N. J... *p.* 494

Sargent Steam Meter Co., 800-802 Sibley St.,
Chicago, Ill.

SWENSON EVAPORATOR CO., 945 Monad-
nock Block, Chicago, Ill... *p.* 501

DITCHERS, RAILROAD
American Hoist & Derrick Co., St. Paul, Minn.

*BALL ENGINE CO., Erie, Pa... *p.* 16

*CLYDE IRON WORKS, 29th Ave., W. &
Michigan St., Duluth, Minn... *p.* 268

DIVIDING HEADS
Simmons Machine Co., Inc., Albany, N. Y.

DIVING APPARATUS
Morse & Son, Inc., Andrew J., 221 High St.,
Boston, Mass.

DOOR AND STEP CONTROL
Consolidated Car-Heating Co., 413 N. Pearl St.,
Albany, N. Y.

DOOR HANGERS
(See Hangers, Door)

DOOR LOCKS, SAFETY
—**Elevator**
Elevator Supplies Co., Inc., 110 W. 40th St.,
New York

Maintenance Co., 417-421 Canal St., New
York

WRIGHT WIRE CO., Worcester, Mass... *p.*
282

—**Furnace**
De Waters Safety Latch Co., Far Rockaway,
N. Y.

DOORS
—**Chain Screen**
Cold Co., E. J., 700 708 S. Caroline St., Balti-
more, Md.

See Catalogue Section for data of firms listed in capital type

DOORS (Continued)

—**Elevator**

COBURN TROLLEY TRACK MFG. CO.,
Holyoke, Mass... *p. 276*
WRIGHT WIRE CO., Worcester, Mass... *p. 282*

—**Fire Proof**

Alignum Fireproof Products Co., 44 Whitehall St., New York
COBURN TROLLEY TRACK MFG. CO.,
Holyoke, Mass... *p. 276*
Kinnear Mfg. Co., Columbus, O.
Penn Metal Co., 201 Devonshire St., Boston, Mass.
WRIGHT WIRE CO., Worcester, Mass... *p. 282*

DOORS AND FRAMES (Furnace)

BLAW-KNOX CO. (Knox), Pittsburgh, Pa.
... *p. 480*
BUDD GRATE CO., 2013 E. Letterly St.,
Kensington, Philadelphia, Pa... *p. 86*
MARSHALL FOUNDRY CO., 1st Natl. Bank
Bldg., Pittsburgh, Pa... *p. 496*
WASHBURN & GRANGER, 50 Church St.,
New York... *p. 91*

DOORS AND SHUTTERS

—**Metal Covered**

COBURN TROLLEY TRACK MFG. CO.,
Holyoke, Mass... *p. 276*

—**Steel (Fire)**

Bayley Co., William, Springfield, O.
Merchant & Evans Co., 2019-2035 Washington
Ave., Philadelphia, Pa.

—**Steel, Rolling**

EDWARDS MFG CO., 306-336 Eggleston Ave.,
Cincinnati, O... *p. 506*
Kinnear Mfg. Co., Columbus, O.
Wilson Corp'n, J. G., Norfolk, Va.

DRAFT CONTROL SYSTEMS

Engineer Co., 17 Battery Place, New York

DRAFT, MECHANICAL

(See Mechanical Draft Apparatus)

DRAFT GEARS (Railroad)

Symington Co., T. H., 30 Church St., New York
Westinghouse Air Brake Co., Wilmerding, Pa.

DRAE LINE EXCAVATORS

(See Excavating Machinery)

DRAW BENCHES

McCall Machine Works, Rochester, N. Y.
Perkins Machine Co., Warren, Mass.

DREDGING MACHINERY

Bennett, Howard D., 2114 Allendale St., Balti-
more, Md.

Bucyrus Co., South Milwaukee, Wis.

*CLYDE IRON WORKS, 29th Ave., W. &
Michigan St., Duluth, Minn... *p. 268*

*FLORY MFG. CO., S., Bangor, Pa... *p. 269*

Hayward Co., 50 Church St., New York

*LIDGERWOOD MFG. CO., 96 Liberty St.,
New York... *p. 271*

Marion Steam Shovel Co., Marion, O.

*MORRIS MACHINE WORKS, Baldwins-
ville, N. Y... *pp. 442, 443*

NEW YORK ENGINEERING CO., 2 Rector
St., New York... *p. 57*

Norborn Engineering Co., 712 Denckla Bldg.,
Philadelphia, Pa.

*POOLE ENGINEERING & MACHINE CO.,
Woodberry, Baltimore, Md... *pp. 196, 197*
Sauerman Bros., 1141 Monadnock Block,
Chicago, Ill.

Superior Iron Works Co., Superior, Wis.
Tampa Shipbuilding & Engineering Co., Tampa,
Fla.

Vulcan Iron Works, Inc., Jersey City, N. J.
Yuba Mfg. Co., Marysville, Cal.

DREDGING SLEEVES

GOODRICH RUBBER CO., B. F., Akron, O.
... *pp. 183, 242*

DRIFTS

CLEVELAND TWIST DRILL CO., Cleveland,
O... *p. 378*

DRILL HEADS

Hoefer Mfg. Co., Freeport, Ill.
Nelson-Blanch Mfg. Co., Detroit, Mich.
Sellew Machine Tool Co., 28 Bayley St., Paw-
tucket, R. I.
Spafford Tool Works (Fortin), 10 Hoadley Place,
Hartford, Conn.

DRILL SHARPENERS

INGERSOLL-RAND CO., 11 Broadway, New
York... *pp. 428, 429*

SULLIVAN MACHINERY CO., 121 S. Michi-
gan Ave., Chicago, Ill... *p. 430*

DRILL SOCKETS AND SLEEVES

American Specialty Co., 29 E. Madison St.,
Chicago, Ill.

CLEVELAND TWIST DRILL CO., Cleveland,
O... *p. 378*

DRILLING AND TAPPING MACHINES

COLBURN MACHINE TOOL CO., Franklin,
Pa... *pp. 340, 341*

DRILLING ATTACHMENTS (High Speed)

Graham Mfg. Co., Providence, R. I.
Harris Engrg. Co., H. E., 1047 Broad St.,
Bridgeport, Conn.
McCROSBY REAMER CO., Meadville, Pa...
pp. 380, 381

DRILLING CABLES

American Mfg. Co., Noble & West Sts., Brook-
lyn, N. Y.

Columbian Rope Co., Auburn, N. Y.

MACOMBER & WHYTE ROPE CO., Kenosha,
Wis... *p. 280*

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J... *p. 281*

WRIGHT WIRE CO., Worcester, Mass... *p. 282*

DRILLING MACHINES

—**Automatic Feed**

*BILTON MACHINE TOOL CO., Bridgeport,
Conn... *p. 353*

—**Bench**

Cincinnati Pulley Machinery Co., Cincinnati, O.
Goodell-Pratt Co., Greenfield, Mass.

Henry & Wright Mfg. Co., 760 Windsor St.,
Hartford, Conn.

Miller Falls Co., Miller Falls, Mass.

NILES-BEMENT-POND CO., 111 Broadway,
New York... *p. 344*

Oliver Mfg. Co., W. W., Buffalo, N. Y.

Rockford Drilling Machine Co., Rockford, Ill.

*ROYERSFORD FOUNDRY & MACHINE
CO., 52 N 5th St., Philadelphia, Pa... *pp. 228, 229*

SLOAN & CHACE MFG. CO., LTD., Sixth
Ave., Cor. N. 13th St., Newark, N. J... *p. 357*

Standard Electric Tool Co., Cincinnati, O.

—**Electric, Portable**

American Electric Tool Co., West Newton,
Mass.

Black & Decker Mfg. Co., 109-15 S. Calvert St.,
Baltimore, Md.

Cincinnati Electrical Tool Co., Freeman & Flint
Sts., Cincinnati, O.

Clark Jr., Electric Co., Jas., 520 W. Main St.,
Louisville, Ky.

Coates Clipper Mfg. Co., 237 Chandler St.,
Worcester, Mass.

Electro-Magnetic Tool Co., 2902 Carroll Ave.,
Chicago, Ill.

Fortuna Machine Co., 127 Duane St., New
York

Hisey Wolf Machine Co., Cincinnati, O.

Independent Pneumatic Tool Co. (Thor), 1307
S. Michigan Ave., Chicago, Ill.

Neil & Smith Electric Tool Co., Cincinnati, O.

Standard Electric Tool Co., Cincinnati, O.

Temco Electric Motor Co., 66 Sugar St., Leipsic,
O.

United States Electrical Tool Co., Cincinnati,
O.

Universal Electric Co., 9 Oliver St., Newark,
N. J.

Doo

VAN DORN ELECTRIC TOOL CO., Cleveland, O... *p.* 370
 WISCONSIN ELECTRIC CO., Racine, Wis... *p.* 371
—Gun Barrel
 PRATT & WHITNEY CO., 111 Broadway, New York... *p.* 344
—Heavy Duty
 Baker Brothers, Toledo, O.
 Barnes Co., W. F. & John, Rockford, Ill.
 COLBURN MACHINE TOOL CO., Franklin, Pa... *pp.* 340, 341
 Foote-Burt Co., Cleveland, O.
 Minster Machine Co., Minster, O.
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 Sibley Machine Co., South Bend, Ind.
 Western Machine Tool Works, Holland, Mich.
—Horizontal
 Detroit Tool Co., 1487 St. Antoine St., Detroit, Mich.
 Hoefler Mfg. Co., Freeport, Ill.
 NATIONAL AUTOMATIC TOOL CO., Richmond, Ind... *p.* 346
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 Rockford Drilling Machine Co., Rockford, Ill.
—Multiple Spindle
 Barnes Drill Co., Inc., 814-830 Chestnut St., Rockford, Ill.
 Baush Machine Tool Co., Springfield, Mass.
 *BILTON MACHINE TOOL CO., Bridgeport, Conn... *p.* 353
 Cincinnati Bickford Tool Co., Cincinnati, O.
 Cincinnati Pulley Machinery Co., Cincinnati, O.
 Cleveland Machinery & Supply Co., Cleveland National Bank Bldg., Cleveland, O.
 COLBURN MACHINE TOOL CO., Franklin, Pa... *pp.* 340, 341
 Detroit Tool Co., 1487 St. Antoine St., Detroit, Mich.
 Foote-Burt Co., Cleveland, O.
 Fox Machine Co., 1807 W. Gansom St., Jackson, Mich.
 Harrington Son & Co., Inc., Edwin, S. E. Cor. 17th & Callowhill Sts., Philadelphia, Pa.
 Michigan Press Co., Ypsilanti, Mich.
 Moline Tool Co., Moline, Ill.
 NATIONAL AUTOMATIC TOOL CO., Richmond, Ind... *p.* 346
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 PRATT & WHITNEY CO., 111 Broadway, New York... *p.* 344
 Reed-Prentice Co., Worcester, Mass.
 Richmond Metal Products Co., Inc., 5th & Arch Sts., Richmond, Va.
 Sipp Machine Co., Paterson, N. J.
 TURNER MACHINE CO., Danbury, Conn... *p.* 347
—Multiple Spindle (Variable Speed)
 NATIONAL AUTOMATIC TOOL CO., Richmond, Ind... *p.* 346
—Pneumatic, Portable
 Cleveland Pneumatic Tool Co., 6410 Hawthorne Ave., Cleveland, O.
 Helwig Mfg. Co., St. Paul, Minn.
 INGERSOLL-RAND CO., 11 Broadway, New York... *pp.* 428, 429
 Pittsburgh Pneumatic Co., Canton, O.
 Shaw Pneumatic Tool Co., C. H., 35th & Wazee Sts., Denver, Colo.
—Radial
 American Tool Works Co., Pearl & Eggleston Aves., Cincinnati, O.
 Baush Machine Tool Co., Springfield, Mass.
 Carlton Machine Tool Co., Spring Grove Ave. & Meeker St., Cincinnati, O.
 Cincinnati Bickford Tool Co., Cincinnati, O.
 Dreses Machine Tool Co., 227 W. McMicken Ave., Cincinnati, O.
 Foedick Machine Tool Co., Blue Rock & Apple Sts., Cincinnati, O.

Hammond Mfg. Co., 336 Frankfort Ave., Cleveland, O.
 Henry & Wright Mfg. Co., 760 Windsor St., Hartford, Conn.
 LYND-FARQUHAR CO., Boston, Mass... *p.* 348
 Morris Machine Tool Co., Cincinnati, O.
 Mueller Machine Tool Co., 2425 Colerain Ave., Cincinnati, O.
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 Sipp Machine Co., Paterson, N. J.
 Western Machine Tool Works, Holland, Mich.
—Radial (Wall)
 LYND-FARQUHAR CO., Boston, Mass... *p.* 348
—Sensitive
 Allen Machine Co., 1585 Columbus Rd., N. W., Cleveland, O.
 *BILTON MACHINE TOOL CO., Bridgeport, Conn... *p.* 353
 Burke Machine Tool Co., Conneaut, O.
 Carlton Machine Tool Co., Spring Grove Ave. & Meeker St., Cincinnati, O.
 Davenport Machine Tool Co., 34 N. 2nd St., New Bedford, Mass.
 Detroit Tool Co., 1487 St. Antoine St., Detroit, Mich.
 Hammond Mfg. Co., 336 Frankfort Ave., Cleveland, O.
 Henry & Wright Mfg. Co., 760 Windsor St., Hartford, Conn.
 PRATT & WHITNEY CO., 111 Broadway, New York... *p.* 344
 Reed Co., Francis, 43 Hammond St., Worcester, Mass.
 *ROYERSFORD FOUNDRY & MACHINE CO., 52 N. 5th St., Philadelphia, Pa... *pp.* 228, 229
 Sibley Machine Co., South Bend, Ind.
 Sipp Machine Co., Paterson, N. J.
 Superior Machine Tool Co., Kokomo, Ind.
 Taylor & Fenn Co., Hartford, Conn.
 Townsend Mfg. Co., H. P., Hartford, Conn.
 Washburn Shops of the Worcester Polytechnic Institute, Worcester, Mass.
—Staybolt
 Richmond Metal Products Co., Inc., 5th & Arch Sts., Richmond, Va.
—Turret
 NATIONAL AUTOMATIC TOOL CO., Richmond, Ind... *p.* 346
 TURNER MACHINE CO., Danbury, Conn... *p.* 347
—Vertical
 Aurora Tool Works, Aurora, Ind.
 Barnes Co., W. F. & John, Rockford, Ill.
 Barnes Drill Co., Inc., 814-830 Chestnut St., Rockford, Ill.
 Boynton & Plummer, Inc., Chester Depot, Vt.
 Canedy-Otto Mfg. Co., Chicago Heights, Ill.
 Cincinnati Bickford Tool Co., Cincinnati, O.
 Cleveland Machinery & Supply Co., Cleveland National Bank Bldg., Cleveland, O.
 Davis Machine Tool Co., Inc., 305 St. Paul St., Rochester, N. Y.
 Hoefler Mfg. Co., Freeport, Ill.
 Leland-Gifford Co., Worcester, Mass.
 LYND-FARQUHAR CO., Boston, Mass... *p.* 348
 Moline Machinery Co., Cor. 3rd Ave. & 20th St., Moline, Ill.
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 Noyes & Co., B. B., Greenfield, Mass.
 Rockford Drilling Machine Co., Rockford, Ill.
 *ROYERSFORD FOUNDRY & MACHINE CO., 52 N. 5th St., Philadelphia, Pa... *pp.* 228, 229
 Sibley Machine Co., South Bend, Ind.
 Sigourney Tool Co., 9 Sigourney St., Hartford, Conn.
 Silver Mfg. Co., Salem, O.
 Simplex Machine Tool Co., Cleveland, O.

Dri

DRILLING MACHINES (Continued)**—Vertical**

Superior Machine Tool Co., Kokomo, Ind.
 TURNER MACHINE CO. (Quint), Danbury,
 Conn... *p.* 347
 U. S. Machine Tool Co., Richmond & McLean
 Ave., Cincinnati, O.

DRILLS**—Blacksmiths'**

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
 Champion Blower & Forge Co., Lancaster, Pa.

—Center

Slocumb Co., J. T., 35 Oxford St., Providence, R. I.

—Concrete, Electric

Electro-Magnetic Tool Co., 2902 Carroll Ave.,
 Chicago, Ill.

—Core

INGERSOLL-RAND CO., 11 Broadway, New
 York... *pp.* 428, 429

McKiernan-Terry Drill Co., 15 Park Row,
 New York

Standard Diamond Drill Co., First National
 Bank Bldg., Chicago, Ill.

SULLIVAN MACHINERY CO., 121 S. Michi-
 gan Ave., Chicago, Ill... *p.* 430

—Diamond

Standard Diamond Drill Co., First National
 Bank Bldg., Chicago, Ill.

—Percussion (Hand Operated)

DIAMOND EXPANSION BOLT CO., 90 West
 St., Cor. Cedar, New York... *p.* 409

INGERSOLL-RAND CO., 11 Broadway, New
 York... *pp.* 428, 429

—Prospecting

Armstrong Mfg. Co., Waterloo, Iowa
 NEW YORK ENGINEERING CO., 2 Rector
 St., New York... *p.* 57

—Ratchet

Armstrong Bros. Tool Co., 315 N. Francisco
 Ave., Chicago, Ill.

Keystone Mfg. Co. (Keystone), 41-45 Chandler
 St., Buffalo, N. Y.

Lowell Wrench Co., 54 Commercial St., Worces-
 ter, Mass.

—Rock

*GENERAL ELECTRIC CO., Schenectady,
 N. Y... *pp.* 20, 21, 521

Hughes Tool Co., Houston, Texas

INGERSOLL-RAND CO., 11 Broadway, New
 York... *pp.* 428, 429

International High Speed Steel Co., 99 Nassau
 St., New York

McKiernan-Terry Drill Co., 15 Park Row,
 New York

Pneumelectric Machine Co., 581 S. Clinton St.,
 Syracuse, N. Y.

Rix Compressed Air & Drill Co., 505 Howard
 St., San Francisco, Cal.

Shaw Pneumatic Tool Co., C. H., 35th & Wazee
 Sts., Denver, Colo.

SULLIVAN MACHINERY CO., 121 S. Michi-
 gan Ave., Chicago, Ill... *p.* 430

—Square Hole

Lawson & Co., Inc., 90 West St., New York

—Stone

DIAMOND EXPANSION BOLT CO., 90
 West St., Cor. Cedar, New York... *p.* 409

INGERSOLL-RAND CO., 11 Broadway, New
 York... *pp.* 428, 429

SULLIVAN MACHINERY CO., 121 S. Michi-
 gan Ave., Chicago, Ill... *p.* 430

—Twist

Alvord Reamer & Tool Co., Millersburg, Pa.
 Buckeye Twist Drill Co., Alliance, O.

Clark Equipment Co., 1415 Railway Exchange,
 Buchanan, Mich.

CLEVELAND TWIST DRILL CO., Cleveland,
 O... *p.* 378

Colton Co., Arthur, Jefferson Ave., Detroit,
 Mich.

Davidson Tool Mfg. Corp'n, 120-124 Maiden
 Lane, New York

Detroit Twist Drill Co., 634 Fort St., W.
 Detroit, Mich.

Lincoln Twist Drill Co., Taunton, Mass.

McCarthy Drill & Tool Corp'n, 30 Church St.,
 New York

Morse Twist Drill & Machine Co., New Bed-
 ford, Mass.

NATIONAL TOOL CO., Cleveland, O... *p.*
 383

National Twist Drill & Tool Co., Brush near
 Boulevard, Detroit, Mich.

New Process Twist Drill Co., Taunton, Mass.

PRATT & WHITNEY CO., 111 Broadway,
 New York... *p.* 344

Rich Tool Co., 513 Railway Exchange, Chicago,
 Ill.

Standard Tool Co., 6900 Central Ave., Cleve-
 land, O.

Syracuse Twist Drill Co., Syracuse, N. Y.

Union Twist Drill Co., Athol, Mass.

Whitman & Barnes Mfg. Co., Akron, O.

—Well

MARK MFG. CO., P. O. Box G, Chicago, Ill.
 ... *p.* 160

DROP FORGINGS, HAMMERS, PRESSES, ETC.

(See Forgings, Hammers, Presses, etc., Drop)

DROPS**—Board**

BLISS CO., E. W., 19 Adams St., Brooklyn,
 N. Y... *pp.* 310, 311

—Pneumatic

BLISS CO., E. W., 19 Adams St., Brooklyn,
 N. Y... *pp.* 310, 311

INGERSOLL-RAND CO., 11 Broadway, New
 York... *pp.* 428, 429

Miles Co., George, Winsted, Conn.

DRY BLAST PLANTS

CARRIER ENGINEERING CORP'N, 39
 Cortlandt St., New York... *p.* 471

DRY KILNS

(See Kilns, Dry)

DEYERS**—Cloth**

PHILADELPHIA DRYING MACHINERY
 CO., Stokely St., Philadelphia, Pa... *p.* 473

PHILADELPHIA TEXTILE MACHINERY
 CO., Philadelphia, Pa... *pp.* 474, 475

—Fibre Board

PHILADELPHIA DRYING MACHINERY
 CO., Stokely St., Philadelphia, Pa... *p.* 473

PHILADELPHIA TEXTILE MACHINERY
 CO., Philadelphia, Pa... *pp.* 474, 475

—Fruit

GALLAND-HENNING MFG. CO., 26th-
 27th Ave. & Layton Park, Milwaukee, Wis.
 ... *p.* 455

PHILADELPHIA TEXTILE MACHINERY
 CO., Philadelphia, Pa... *pp.* 474, 475

—Leather

PHILADELPHIA DRYING MACHINERY
 CO., Stokely St., Philadelphia, Pa... *p.* 473

PHILADELPHIA TEXTILE MACHINERY
 CO., Philadelphia, Pa... *pp.* 474, 475

Seymour, Jr., J. M., 51-53 Lawrence St., New-
 ark, N. J.

—Lumber and Veneer

AMERICAN BLOWER CO., Detroit, Mich.
 ... *pp.* 434, 435

Barney Ventilating Fan Works, 19 Chardon St.,
 Boston, Mass.

Drying Systems, Inc., 322 N. Michigan Ave.,
 Chicago, Ill.

Merritt Mfg. Co., Lockport, N. Y.

PHILADELPHIA DRYING MACHINERY
 CO., Stokely St., Philadelphia, Pa... *p.* 473

PHILADELPHIA TEXTILE MACHINERY
 CO., Philadelphia, Pa... *pp.* 474, 475

—Meal

Louisville Drying Machinery Co., 451 Baxter
 Ave., Louisville, Ky.

Dri

—Raw Stock

PHILADELPHIA TEXTILE MACHINERY CO., Philadelphia, Pa... *pp.* 474, 475

—Rotary

American Process Co., 68 William St., New York

BARTLETT & SNOW CO., C. O., Cleveland, O... *p.* 249

BONNOT CO., Canton, O... *p.* 464

Cumtner & Son Co., F. D. (Cumtner), 413 The Arcade, Cleveland, O.

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis... *p.* 455

Grupe Drier & Boiler Co., 325-331 E. Second St., Davenport, Ia.

General Reduction, Gas & By-Products Co., 49 Wall St., New York

Hersey Mfg. Co., South Boston, Mass.

***LOCOMOTIVE PULVERIZED FUEL CO.**, 30 Church St., New York... *p.* 93

Louisville Drying Machinery Co., 451 Baxter Ave., Louisville, Ky.

Mashek Engineering Co., 90 West St., New York

PHOENIX IRON WORKS CO., Meadville, Pa... *p.* 497

Ruggles-Coles Engineering Co., 50 Church St., New York

Union Engineering Co., Cuyahoga & W. 4th St., Cleveland, O.

—Sand

BARTLETT & SNOW CO., C. O., Cleveland, O... *p.* 249

Standard Sand & Machine Co., Cleveland, O.

—Tobacco

PHILADELPHIA DRYING MACHINERY CO., Stokely St., Philadelphia, Pa... *p.* 473

—Vacuum

BARTLETT & SNOW CO., C. O., Cleveland, O... *p.* 249

Buffalo Foundry & Machine Co., E. Perry St. & Fillmore Ave., Buffalo, N. Y.

Devine Co., J. P., 1372 Clinton St., Buffalo, N. Y.

Hubbard's Sons, Norman, 265 Water St., Brooklyn, N. Y.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p.* 494

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p.* 496

Perrin & Co., Wm. R., 37 W. Van Buren St., Chicago, Ill.

—Yarn

PHILADELPHIA TEXTILE MACHINERY CO., Philadelphia, Pa... *pp.* 474, 475

DRYING APPARATUS

AMERICAN BLOWER CO., Detroit, Mich... *pp.* 434, 435

BARTLETT & SNOW CO., C. O., Cleveland, O... *p.* 249

BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... *p.* 470

CARRIER ENGINEERING CORP'N, 39 Cortlandt St., New York... *p.* 471

Colorado Iron Works Co., Box 989, Denver, Colo.

Cutter, Geo. A., Taunton, Mass.

Drying Systems, Inc., 322 N. Michigan Ave., Chicago, Ill.

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis... *p.* 455

Gordon Engineering Corp'n, 39 Cortlandt St., New York

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p.* 496

Merrill, Inc., C. J., 131 Preble St., Portland, Me.

PHILADELPHIA DRYING MACHINERY CO., Stokely St., Philadelphia, Pa... *p.* 473

PHILADELPHIA TEXTILE MACHINERY CO., Philadelphia, Pa... *pp.* 474, 475

Ruggles-Coles Engineering Co., 50 Church St., New York

Seymour, Jr., J. M., 51-53 Lawrence St., Newark, N. J.

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. St. Louis, Mo... *p.* 476

Stearns-Roger Mfg. Co., 1718-1720 California St., Denver, Colo.

STERLING BLOWER CO., Hartford, Conn... *p.* 436

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp.* 74, 75

SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill... *p.* 501

DUMBWAITERS

Elevator Supplies Co., Inc., 119 W. 40th St., New York

Sedgwick Machine Works, 146 W. 15th St., New York

Speidel, J. G., Reading, Pa.

Standard Electric & Elev. Co., 123 S. Calvert St., Baltimore, Md.

—Electric

Bates Elevator Co., 211 President St., Baltimore, Md.

General Elevator Co., 29 Broadway, New York

McLauthlin Co., Geo. T., 120 Fulton St., Boston, Mass.

Roberts Elevator Co., James H., 430 W. Broadway, New York

Storm Mfg. Co., 50 Vesey St., Newark, N. J.

Warner Elevator Mfg. Co., Cincinnati, Ohio

—Hydraulic Plunger

Standard Plunger Elevator Co., 243 Stafford St., Worcester, Mass.

DUMP CARS

(See Cars, Dump)

DUST COLLECTING SYSTEMS

Clark Dust Collecting Co., Fisher Bldg., Chicago, Ill.

Cleveland Blow Pipe & Mfg. Co., 6302 Kinsman Road, Cleveland, O.

Dixie Mfg. Co., Inc., Russell St. & B. & O. R. R., Baltimore, Md.

Meadon's Blower & Pipe Works, 23-27 Meserole Ave., Brooklyn, N. Y.

Merrill, Inc., C. J., 131 Preble St., Portland, Me.

Northern Blower Co., Cleveland, Ohio

***PANGBORN CORP'N**, P. O. Box 859, Hagerstown, Md... *pp.* 460, 461

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... *p.* 476

STERLING BLOWER CO., Hartford, Conn... *p.* 436

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp.* 466, 467

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp.* 74, 75

DUST COLLECTORS

BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... *p.* 470

Cyclone Blow Pipe Co., 2552 W. 21st St., Chicago, Ill.

Knickerbocker Co., Jackson, Mich.

Meadon's Blower & Pipe Works, 23-27 Meserole Ave., Brooklyn, N. Y.

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... *p.* 476

Slv Mfg. Co., W. W., Cleveland, O.

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp.* 74, 75

—Cloth

Clark Dust Collecting Co., Fisher Bldg., Chicago, Ill.

Illinois Mfg. & Supply Co., Quincy, Ill.

STERLING BLOWER CO., Hartford, Conn... *p.* 436

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp.* 466, 467

—Metal

Allington & Curtis Mfg. Co., 400 Holden St., Saginaw, Mich.

Clark Dust Collecting Co., Fisher Bldg., Chicago, Ill.

Cleveland Blow Pipe & Mfg. Co., 6302 Kinsman Road, Cleveland, O.

Dus

DUST COLLECTORS (Continued)

—Lead Metal

STERLING BLOWER CO., Hartford, Conn...
p. 436

STROUD & CO., E. H., 928-934 Fullerton Ave.,
Chicago, Ill... pp. 466, 467

DUST DETERMINATORS

BRAEMER AIR CONDITIONING CORP'N,
Lafayette Bldg., Philadelphia, Pa... p. 470

*PRECISION INSTRUMENT CO., Detroit,
Mich... p. 524

Sargent Steam Meter Co., 800-802 Sibley St.,
Chicago, Ill.

DYEING MACHINERY

PFAUDLER CO., Rochester, N. Y... p. 499

PHILADELPHIA DRYING MACHINERY
CO., Stokely St., Philadelphia, Pa... p. 473

Townsend Furnace & Machine Shop Co., Broad-
way & Rensselaer St., Albany, N. Y.

DYNAMOMETERS

Chatillon & Sons, John, 85-93 Cliff St., New York

*GENERAL ELECTRIC CO., Schenectady,
N. Y... pp. 20, 21, 521

Sprague Electric Works, 527 W. 34th St., New
York

Standard Motor Construction Co., 174 Whiton
St., Jersey City, N. J.

*WESTINGHOUSE ELECTRIC & MFG.
CO., East Pittsburgh, Pa... pp. 114, 115

E

ECONOMIZERS, FUEL

*GREEN FUEL ECONOMIZER CO., 90 West
St., New York... p. 73

STURTEVANT CO., B. F., Hyde Park, Boston,
Mass... pp. 74, 75

UNIFLOW BOILER CO., INC., Philadelphia,
Pa... p. 62

EDGING MACHINES

TOLEDO MACHINE & TOOL CO., Toledo,
O... p. 313

EJECTORS

AMERICAN INJECTOR CO., Detroit, Mich.
... p. 151

Hancock Inspirator Co., 119 W. 40th St., New
York

Hayden & Derby Mfg. Co., 119 W. 40th St.,
New York

PENBERTHY INJECTOR CO., Detroit, Mich.
... pp. 152, 153

Tranter Mfg. Co., 105 Water St., Pittsburgh,
Pa.

—Ash (Hydraulic)

Great Lakes Engineering Works, Detroit, Mich.

—Ash (Suction)

AMERICAN STEAM CONVEYOR CORP'N,
326 W. Madison St., Chicago, Ill... p. 101

*GREEN ENGINEERING CO., 13 Kennedy
Ave., East Chicago, Ind... pp. 80, 81

—Sewage (Centrifugal)

Beggs & Co., James, 36 Warren St., New York

Chicago Pump Co., 904-10 W. Lake St., Chicago,
Ill.

Economy Pumping Machinery Co., 116 N. Car-
penter St., Chicago, Ill.

Simplex Ejector Co., 1050 Randolph St., Chicago,
Ill.

Twinvolute Pump & Mfg. Co., 216-228 High St.,
Newark, N. J.

Yeomans Bros. Co., Jeffrey Bldg., Chicago, Ill.

—Sewage (Pneumatic)

Blackburn-Smith Corp'n, 105 W. 40th St.,
New York

Pacific Flush Tank Co., 149 Broadway, New York

Simplex Ejector Co., 1050 Randolph St., Chicago,
Ill.

Yeomans Bros. Co., Jeffrey Bldg., Chicago, Ill.

ELBOWS, UNION

*AMERICAN DISTRICT STEAM CO., North
Tonawanda, N. Y... p. 140

Bard Union Co., Inc., Norwich, Conn.

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... pp. 120, 121, 122, 123

KELLY & JONES CO., Greensburg, Pa... pp.
130, 131

MALLEABLE IRON FITTINGS CO., Bran-
ford, Conn... p. 157

**ELECTRIC FURNACES, GENERATORS,
HOISTS, TRUCKS, WELDING, ETC.**

(See Furnaces, Generator, Hoists, Trucks,
Welding, etc., Electric)

ELECTRICAL MACHINERY

Adams-Bagnall Electric Co., Cleveland, O.

*ALLIS-CHALMERS MFG. CO., Milwaukee,
Wis... p. 15

Burke Electric Co., Erie, Pa.

Electro-Dynamic Co., Bayonne, N. J.

Electric Machinery Co., Minneapolis, Minn.

*GENERAL ELECTRIC CO., Schenectady,
N. Y... pp. 20, 21, 521

General Vehicle Co., Inc., Long Island City, N. Y.

Ideal Electric & Mfg. Co., Mansfield, O.

Industrial Electric Furnace Co., 1405 Monad-
nock Bldg., Chicago, Ill.

Kimble Electric Co., 634 N. Western Ave.,
Chicago, Ill.

Langstadt Meyer Co., Appleton, Wis.

Roth Bros. & Co., 1400 W. Adams St., Chicago,
Ill.

Standard Construction Engrg. & Supply Co.,
1752 N. 29th St., Philadelphia, Pa.

White Dental Mfg. Co., S. S., 211 S. 12th St.,
Philadelphia, Pa.

Triumph Electric Co., Oakley, Cincinnati, O.

*WESTINGHOUSE ELECTRIC & MFG. CO.,
East Pittsburgh, Pa... pp. 114, 115

**ELECTRICAL MEASURING INSTRU-
MENTS**

(See Instruments, Electrical Measuring)

ELECTRICAL SPECIALTIES

Hubbell, Inc., Harvey, Bridgeport, Conn.

ELECTRICAL SUPPLIES

Adams-Bagnall Electric Co., Cleveland, O.

BENJAMIN ELECTRIC MFG. CO., 122 S.
Sangamon St., Chicago, Ill... p. 504

Craghead Engineering Co., 340-342 Main St.
Cincinnati, O.

D & W FUSE CO., Providence, R. I... p. 391

*JOHNS-MANVILLE CO., H. W., 296 Madison
Ave., New York... p. 162

Risdon Tool & Machine Co., Andrew Ave.
Nauvau, Conn.

Sterling Varnish Co., 528 Fulton Bldg., Pitts-
burgh, Pa.

Waterbury Battery Co., Waterbury, Conn.

ELECTRICAL TESTING APPARATUS

BIDDLE, JAMES G. 1211-1213 Arch St.
Philadelphia, Pa... p. 539

BROWN INSTRUMENT CO., Philadelphia
Pa... p. 531

*GENERAL ELECTRIC CO., Schenectady,
N. Y... pp. 20, 21, 521

Leeds & Northrup Co., 4901 Stenton Ave.
Philadelphia, Pa.

*WESTINGHOUSE ELECTRIC & MFG. CO.,
East Pittsburgh, Pa... pp. 114, 115

*WESTON ELECTRICAL INSTRUMENT
CO., 49 Weston Ave., Waverly Park, Newark,
N. J... p. 537

ELECTRODES (Arc Welding)

*QUASI ARC WELDTRODE CO., INC.
107-109 Lafayette St., New York... p. 422

ELECTROTYPING MACHINERY

Hoe & Co., R., 504-520 Grand St., New York

**ELEVATING AND CONVEYING MACHIN-
ERY**

Alvey-Ferguson Co., 75 North Ave., Oakley
Cincinnati, O.

Alvey Mfg. Co., 3201 S. Broadway, St. Louis
Mo.

BARTLETT & SNOW CO., C. O., Cleveland,
O... p. 249

*CALDWELL & SON CO., H. W., 17th St. &
Western Ave., Chicago, Ill... p. 250

Dus

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis...*pp. 118, 119*
 Dull Co., Raymond W., 111 W. Washington St., Chicago, Ill.
 FARNHAM MFG. CO., 31-39 Indiana St., Buffalo, N. Y...*p. 277*
 Gifford-Wood Co., Hudson, N. Y.
 *HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y...*pp. 252, 253*
 Jeffrey Mfg. Co., 904 N. Fourth St., Columbus, O.
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill...*p. 194*
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill...*p. 256*
 Meese & Gottfried Co., 660 Mission St., San Francisco, Cal.
 Olson & Co., Samuel, 2418-22 Bloomingdale Ave., Chicago, Ill.
 ROBINS CONVEYING BELT CO., Park Row Bldg., New York...*p. 257*
 Scottdale Machine & Mfg. Co., Scottdale, Pa.
 STANDARD CONVEYOR CO., North St. Paul, Minn...*p. 261*
 Stephens-Adamson Mfg. Co., Aurora, Ill.
 Union Chain & Mfg. Co., Seville, O.
 Union Engineering Co., Cuyahoga & W. 4th St., Cleveland, O.
 Union Iron Works, Decatur, Ill.
 WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill...*pp. 258, 259, 260*

ELEVATING TRUCKS
 (See Trucks, Elevating)

ELEVATOR APPLIANCES
 Elevator Supplies Co., Inc., 119 W. 40th St., New York
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa...*pp. 114, 115*
 Wheeler-McDowell Elevator Co., 417-421 Canal St., New York

ELEVATOR CABS AND ENCLOSURES
 Bolles Iron & Wire Works, J. E., 53 Porter St., Detroit, Mich.
 Cincinnati Mfg. Co., Cincinnati, O.
 Kamman Mfg. Co., Walter, 3264 Spring Grove Ave., Cincinnati, O.
 Ohio Elevator & Machine Co., Columbus, O.
 Smith-Rhea Co., Baltimore, Md.
 WRIGHT WIRE CO., Worcester, Mass...*p. 282*

ELEVATOR GUIDES (Cold Drawn)
 *UNION DRAWN STEEL CO., Beaver Falls, Pa...*p. 300*

ELEVATORS
 —Electric
 Albro-Clem Elevator Co., Erie Ave. & D St., Philadelphia, Pa.
 American Electric Machine & Elevator Co., 1706 N. 12th St., St. Louis, Mo.
 American Elevator & Machine Co., Louisville, Ky.
 Bates Elevator Co., 211 President St., Baltimore, Md.
 Eastern Machinery Co., New Haven, Conn.
 General Elevator Co., 29 Broadway, New York
 Gurney Co., Honesdale, Pa.
 Gurney Elevator Co., 62 W. 45th St., New York
 Haughton Elevator & Machine Co., 671-693 Spencer St., Toledo, O.
 Kieckhefer Elevator Co., A., 1026-1104 St. Paul Ave., Milwaukee, Wis.
 Kimball Bros. Co., Council Bluffs, Ia.
 LAMSON CO., 100 Boylston St., Boston, Mass...*pp. 254, 255*
 McLauthlin Co., Geo. T., 120 Fulton St., Boston, Mass.
 Marshall Bros. Co., 21st & Mary Sts., South Side, Pittsburgh, Pa.
 Moore & Wyman Elevator & Machine Works, Granite & Richard Sts., Boston, Mass.
 Reedy Co., H. J., Cincinnati, O.
 Roberts Elevator Co., James H., 430 W. Broadway, New York

See Electric Elevator Co., A. B., 220 Broadway, New York
 Sidney Elevator Mfg. Co., Sidney, O.
 Speidel, J. G., Reading, Pa.
 Warner Elevator Mfg. Co., Cincinnati, O.
 Wetherill & Co., Inc., Robt. (Dept. of Sun Shipbuilding Co.), Chester, Pa.
 Wheeler-McDowell Elevator Co., 417-421 Canal St., New York

—Hand Power
 Bates Elevator Co., 211 President St., Baltimore, Md.
 Kimball Bros. Co., Council Bluffs, Ia.
 LAMSON CO., 100 Boylston St., Boston, Mass...*pp. 254, 255*
 Sedgwick Machine Works, 146 W. 15th St., New York
 Sidney Elevator Mfg. Co., Sidney, O.
 Speidel, J. G., Reading, Pa.
 Warner Elevator Mfg. Co., Cincinnati, O.

—Hydraulic
 Haughton Elevator & Machine Co., 671-693 Spencer St., Toledo, O.
 Marshall Bros. Co., 21st & Mary Sts., South Side, Pittsburgh, Pa.

—Hydraulic Plunger
 General Elevator Co., 29 Broadway, New York
 Kieckhefer Elevator Co., A., 1026-1104 St. Paul Ave., Milwaukee, Wis.
 Ohio Elevator & Machine Co., Columbus, O.
 Standard Plunger Elevator Co., 243 Stafford St., Worcester, Mass.
 Wetherill & Co., Inc., Robt. (Dept. of Sun Shipbuilding Co.), Chester, Pa.

—Inclined
 BARTLETT & SNOW CO. C. O., Cleveland, O...*p. 249*
 BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill...*p. 262*
 *CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill...*p. 250*
 LAMSON CO., 100 Boylston St., Boston, Mass.
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill...*p. 256*
 Otis Elevator Co., 11th Ave. & 26th St., New York
 PORTABLE MACHINERY CO., INC., Passaic, N. J...*p. 253*
 Robins Conveying Belt Co., Park Row Bldg., New York...*p. 257*
 STANDARD CONVEYOR CO., North St. Paul, Minn...*p. 261*
 Sturtevant Mill Co., Harrison Sq., Boston, Mass.
 WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill...*pp. 258, 259, 260*

—Passenger and Freight
 Albro-Clem Elevator Co., Erie Ave. & D St., Philadelphia, Pa.
 American Elevator & Machine Co., Louisville, Ky.
 Baker Iron Works, 950 N. Broadway, Los Angeles, Cal.
 Eastern Machinery Co., New Haven, Conn.
 General Elevator Co., 29 Broadway, New York
 Gurney Co., Honesdale, Pa.
 Gurney Elevator Co., 62 W. 45th St., New York
 Haughton Elevator & Machine Co., 671-693 Spencer St., Toledo, O.
 Kieckhefer Elevator Co., A., 1026-1104 St. Paul Ave., Milwaukee, Wis.
 Kimball Bros. Co., Council Bluffs, Ia.
 McLauthlin Co., Geo. T., 120 Fulton St., Boston, Mass.
 Maintenance Co., 417-421 Canal St., New York
 Marshall Bros. Co., 21st & Mary Sts., South Side, Pittsburgh, Pa.
 Mason & Co., Inc., Volney W., 2 Lafayette St., Providence, R. I.
 Moore & Wyman Elevator & Machine Works, Granite & Richard Sts., Boston, Mass.
 Ohio Elevator & Machine Co., Columbus, O.
 Otis Elevator Co., 11th Ave. & 26th St., New York

Ele

ELEVATORS (Continued)—**Passenger and Freight**

Park Mfg. Co., Charlotte, N. C.
 Reedy Co., H. J., Cincinnati, O.
 Ridgway & Son Co., Craig, Coatesville, Pa.
 See Electric Elevator Co., A. B., 220 Broadway,
 New York

Sidney Elevator Mfg. Co., Sidney, O.
 Smith-Rhea Co., Baltimore, Md.
 Standard Electric & Elev. Co., 123 S. Calvert
 St., Baltimore, Md.
 Standard Plunger Elevator Co., 243 Stafford
 St., Worcester, Mass.
 Storm Mfg. Co., 50 Vesey St., Newark, N. J.
 Warner Elevator Mfg. Co., Cincinnati, Ohio
 Westbrook Elevator Mfg. Co., Inc., Danville,
 Va.
 Wheeler-McDowell Elevator Co., 417-421 Canal
 St., New York

—**Portable**

Baker Economic Transport Corp'n, 31 Nassau
 St., New York
 BROWN PORTABLE CONVEYING MA-
 CHINERY CO., Chicago, Ill... p. 262
 Economy Engineering Co., 415 S. Washtenaw
 Ave., Chicago, Ill.

*LINK-BELT CO., 39th St. & Stewart Ave.,
 Chicago, Ill... p. 256

PORTABLE MACHINERY CO., INC., Passaic,
 N. J... p. 263

Revolutor Co., 344 Garfield Ave., Jersey City,
 N. J.

WELLER MFG. CO., 1820-1856 N. Kostner
 Ave., Chicago, Ill... pp. 258, 259, 260

—**Steam Hydraulic**

Ridgway & Son Co., Craig, Coatesville, Pa.

—**Telescopic**

American Machinery Co., 103 W. Water St.,
 Milwaukee, Wis.
 BARTLETT & SNOW CO., C. O., Cleveland,
 O... p. 249

Ele

*LINK-BELT CO., 39th St. & Stewart Ave.,
 Chicago, Ill... p. 256

WELLER MFG. CO., 1820-1856 N. Kostner
 Ave., Chicago, Ill... pp. 258, 259, 260

—**Traction**

Reedy Co., H. J., Cincinnati, O.
 See Electric Elevator Co., A. B., 220 Broadway,
 New York
 Warner Elevator Mfg. Co., Cincinnati, O.

EMERY WHEELS

(See Grinding Wheels)

ENAMELING

Pickling Enameling Corp'n, Second at Webster
 Aves., Long Island City, N. Y.

ENAMELING MACHINERY

American Insulating Machinery Co., Inc.,
 Fairhill & Huntington Sts., Philadelphia, Pa.

ENCLOSURES, TOOL ROOM

WRIGHT WIRE CO., Worcester, Mass... p.
 282

ENGINE STARTERS

Air Device Mfg. Co., 2977 Cottage Grove Ave.,
 Chicago, Ill.

ENGINE STOPS

Consolidated Engine Stop Co., 350 W. 38th St.,
 New York

*CRANE CO., 836 S. Michigan Ave., Chicago,
 Ill... pp. 120, 121, 122, 123

Falls Machine Co., Sheboygan Falls, Wis.

Locke Regulator Co., Salem, Mass.
 NORDBERG MFG. CO., Milwaukee, Wis...
 p. 19

Ruggles-Klingman Mfg. Co., 10 High St., Boston,
 Mass.

Strong, Carlisle & Hammond Co., Cleveland, O.

ENGINEERS' SUPPLIES

*CRANE CO., 836 S. Michigan Ave., Chicago,
 Ill... pp. 120, 121, 122, 123

Eagle Oil & Supply Co., 44-45-46 India St.,
 Boston, Mass.

*GREENE, TWEED & CO., 109 Duane St.,
 New York... p. 168

Phoenix Automatic Filter Co., 315-317 6th St.,
 Racine, Wis.

SIMMONS CO., JOHN, 110 Center St., New
 York... p. 515

ENGINES—**Alcohol**

*NATIONAL METER CO., 299 Broadway,
 New York... pp. 35, 517

Remington Oil Engine Co., Stamford, Conn.
 Wolverine Motor Works, Bridgeport, Conn.

—**Blowing**

*ALLIS-CHALMERS MFG. CO., Milwaukee,
 Wis... p. 15

DE LAVAL STEAM TURBINE CO., Trenton,
 N. J... p. 22

Jackson Compressor Co., Cor. Cherokee &
 Alameda Sts., Denver, Colo.

NORDBERG MFG. CO., Milwaukee, Wis...
 p. 19

Weimer Machine Works Co., Lebanon, Pa.

*WORTHINGTON PUMP & MACHINERY
 CORP'N, 115 Broadway, New York... pp. 30,
 117, 431, 447

—**Distillate**

Angola Gas Engine Co., Angola, Ind.
 Wolverine Motor Works, Bridgeport, Conn.

—**Gas**

Advance Mfg. Co. (Hamilton), Hamilton, O.
 Alberger Gas Engine Co., 285 Chicago St.,
 Buffalo, N. Y.

*ALLIS-CHALMERS MFG. CO., Milwaukee,
 Wis... p. 15

American Engine Co., 2nd & Amsterdam Ave.,
 Detroit, Mich.

American Whaley Engine Co., 136 Federal St.,
 Boston, Mass.

Angels Iron Works, Angels Camp, Cal.
 Angola Gas Engine Co., Angola, Ind.

Augustine Automatic Rotary Engine Co.,
 1862 Elmwood Ave., Buffalo, N. Y.

Backus Water Motor Co., 172-182 Pennsylv-
 ania Ave., Newark, N. J.

Bartlett Hayward Co., Baltimore, Md.
 Benninghofen Sons, C., Hamilton, O.

Bessemer Gas Engine Co., Grove City, Pa.
 Bruce-MacBeth Engine Co., Cleveland, O.

Buckeye Mfg. Co., Anderson, Ind.
 Butler Engine & Foundry Co., Butler, Pa.

Callahan Co., W. P., Dayton, O.
 Clay Engine Co., 6950 Kinsman Road, Cleve-
 land, O.

Cook Motor Co., Delaware, O.
 Cooper Co., C. & C., Mt. Vernon, O.

Dissinger & Bro., Inc., C. H. A., Wrightsville,
 Pa.

DuBois Iron Works, 805 Brady Sts., DuBois,
 Pa.

Foos Gas Engine Co., Springfield, O.
 Galloway Co., Wm., Waterloo, Ia.

Hall Gas Engine Co., Bridesburg, Philadelphia,
 Pa.

Hooven, Owens, Rentschler Co., Hamilton, O.
 HOPE ENGINEERING & SUPPLY CO.,
 Mt. Vernon, O... p. 32

Jackson Compressor Co., Cor. Cherokee &
 Alameda Sts., Denver, Colo.

JACOBSON ENGINEERING CO., Albany,
 N. Y... p. 31

Jacobson Machine Mfg. Co., Warren, Pa.

JOHNSON MACHINE CO., CARLYLE, Man-
 chester, Conn... p. 209

LaZier Gas Engine Co., Buffalo, N. Y.

Lucey Mfg. Corp'n, Woolworth Bldg., New
 York

McEwen Brothers, Wellsville, N. Y.

Meriam Co., 8405 Detroit Ave., Cleveland, O.

Mesta Machine Co., Box 1124, Pittsburgh, Pa.

Middletown Machine Co., Middletown, O.

MILWAUKEE RELIANCE BOILER WORKS,
 Milwaukee, Wis... p. 112

Myrick Machine Co., Olean, N. Y.

*NATIONAL METER CO., 299 Broadway,
 New York... pp. 33, 517

Advertisements of firms marked * appear in The Journal, A. S. M. E.

National Supply Co., 136 Huron St., Toledo, O.
NOVO ENGINE CO., Lansing, Mich...*pp.*
444, 445

OIL CITY BOILER WORKS, Oil City, Pa...*p.*
58

Olin Gas Engine Co., 10 Lock St., Buffalo, N. Y.
 Otto Engine Mfg. Co., 33rd & Walnut Sts.,
 Philadelphia, Pa.

Page Engineering Co., Foot Latrobe Park,
 Baltimore, Md.

Portsmouth Engine Co., Portsmouth, O.
 Rathbun-Jones Engineering Co., Toledo, O.

Rollins Engine Co., Nashua, N. H.

Ruger Mfg. Co., J. W., 222 Chicago St., Buffalo,
 N. Y.

Reeves Engineering Co., Trenton, N. J.
 Southern Engine & Boiler Works, Jackson,
 Tenn.

Standard Gas Engine Co., East Oakland, Cal.

Superior Gas Engine Co., Springfield, O.

Turner-Fricke Mfg. Co., Pittsburgh, Pa.

Union Tool Co., Torrance, Cal.

United Engine Co., Lansing, Mich.

West Chester Engine Co., West Chester, Pa.

Western Machinery Co., 900 N. Main St., Los
 Angeles, Cal.

***WESTINGHOUSE ELECTRIC & MFG. CO.**,
 East Pittsburgh, Pa...*pp. 114, 115*

White Gas Engine Co., Charles, Baltimore, Md.

Witte Engine Works, Kansas City, Mo.

Wolverine Motor Works, Union Ave., Bridge-
 port, Conn.

—Gas, Natural

Alberger Gas Engine Co., 285 Chicago St.,
 Buffalo, N. Y.

Bruce-MacBeth Engine Co., Cleveland, O.

Buckeye Machine Co., Lima, O.

HOPE ENGINEERING & SUPPLY CO.,
 Mt. Vernon, O...*p. 32*

Miller Improved Gas Engine Co., Springfield,
 O.

***NATIONAL METER CO.**, 299 Broadway,
 New York...*pp. 33, 517*

NOVO ENGINE CO., Lansing, Mich...*pp.*
444, 445

Rathbun-Jones Engineering Co., Toledo, O.

Reid Gas Engine Co., Joseph, Oil City, Pa.

Schenck Mfg. & Supply Co., Parkers Landing,
 Pa.

—Gasoline

Advance Mfg. Co. (Hamilton), Hamilton, O.

Aerothrust Engine Co., LaPorte, Mo.

Alamo Engine Co., Hillsdale, Mich.

American-Blakeslee Mfg. Co., Birmingham, Ala.

Anderson Engine Co., 4036 N. Rockwell St.,
 Chicago, Ill.

Angola Gas Engine Co., Angola, Ind.

Associated Manufacturers Co., Waterloo, Ia.

Automatic Machine Co., Bridgeport, Conn.

Bartlett Hayward Co., Baltimore, Md.

Bauroth Brothers, Springfield, O.

Benninghofen Sons, C., Hamilton, O.

Blount Engineering Co., 100 High St., Boston,
 Mass.

Bond Co., Harold L., 383-391 Atlantic Ave.,
 Boston, Mass.

Brownwall Engine & Pulley Co., 12 W. 4th St.,
 Holland, Mich.

Buckeye Machine Co., Lima, O.

Buckeye Mfg. Co., Anderson, Ind.

Buffalo Gasoline Motor Co., 1280-1290 Niagara
 St., Buffalo, N. Y.

Burlingame S. F., W. Boylston St., Worcester,
 Mass.

Callahan Co., W. P., Dayton, O.

Carbone & Co., A., 114 Centre St., New York

Castle Engineering Co., Inc., A. M., La Crosse,
 Wis.

Central Iron Works, Stevens Point, Portage
 Co., Wis.

Charter Gas Engine Co., Sterling, Ill.

Christensen Engineering Co., 841 30th St.,
 Milwaukee, Wis.

Clark Bros. Co., Olean, N. Y.

Clay Engine Co., 6950 Kinsman Road, Clevel-
 and, O.

Climax Engineering Co., Clinton, Ia.

***CLYDE IRON WORKS**, 29th Ave., W., &
 Michigan St., Duluth, Minn...*p. 268*

Cook Motor Co., Delaware, O.

Domestic Engine & Pump Co., Shippensburg,
 Pa.

DuBois Iron Works, 805 Brady St., DuBois,
 Pa.

Duensenberg Motors Corp'n, 120 Broadway,
 New York

Elbridge Engine Co., 328 Main St., E., Rochester,
 N. Y.

Enterprise Machinery Co., Minneapolis, Minn.

Evansville Gas Engine Works, Evansville, Ind.

Fairbanks-Morse & Co., 920 Wabash Ave.,
 Chicago, Ill.

Fairmont Gas Engine & Railway Motor Car
 Co., North Main St., Fairmont, Minn.

Fay & Bowen Engine Co., Geneva, N. Y.

Field-Brundage Co., Jackson, Mich.

Fuller & Johnson Mfg. Co., Madison, Wis.

Fulton Mfg. Co., 12th & Cranberry Sts., Erie,
 Pa.

Gade Bros. Mfg. Co., Iowa Falls, Ia.

Gibbs Gas Engine Co., of Florida, 26 S. Main St.,
 Jacksonville, Fla.

Hall-Scott Motor Car Co., Inc., Crocker Bldg.,
 San Francisco, Cal.

Hettinger Engine Co., Bridgetown, N. J.

Ideal Engine Co., Lansing, Mich.

JOHNSON MACHINE CO., CARLYLE, Man-
 chester, Conn...*p. 209*

Kahlenberg Bros. Co., Two Rivers, Wis.

LaZier Gas Engine Co., Buffalo, N. Y.

Lennox Machine Co., 2558 W. 16th St., Chicago,
 Ill.

Lunt-Moss Co., 43 S. Market St., Boston, Mass.

McKeen Motor Car Co., 1222 Webster St.,
 Omaha, Neb.

Myrick Machine Co., Olean, N. Y.

***NATIONAL METER CO.**, 299 Broadway,
 New York...*pp. 33, 517*

National Transit Pump & Machine Co., Oil
 City, Pa.

"New-Way" Motor Co., Lansing, Mich.

NOVO ENGINE CO., Lansing, Mich...*pp.*
444, 445

Olin Gas Engine Co., 10 Lock St., Buffalo, N. Y.

Olmstead & Sons, A. E., Pulaski, N. Y.

Otto Engine Mfg. Co., 33rd St. & Walnut St.,
 Philadelphia, Pa.

Ottumwa-Moline Engine & Pump Co., Ottumwa,
 Ia.

Pittsburgh Model Engine Co., 1474 Frick Bldg.,
 Annex, Pittsburgh, Pa.

Portsmouth Engine Co., Portsmouth, O.

Regal Gasoline Engine Co., Coldwater, Mich.

Reliance Engineering Co. (Olds), Lansing,
 Mich.

Rider-Ericsson Engine Co., 20 Murray St.,
 New York

Rochester Motors Co., Inc., Rochester, N. Y.

Standard Gas Engine Co., East Oakland, Cal.

Standard Motor Construction Co., 174 Whiton
 St., Jersey City, N. J.

Steiner & Co., M., 242 Torrence St., Dayton,
 O.

Stickney Co., Charles A., St. Paul, Minn.

Stover Mfg. & Engine Co., Freeport, Ill.

STURTEVANT CO., B. F., Hyde Park, Boston,
 Mass...*pp. 74, 75*

Superior Gas Engine Co., Springfield, O.

Termaat & Monahan Mfg. Co., Oshkosh, Wis.

Turbo Co., 1465 Broadway, New York

Union Gas Engine Co., Oakland, Cal.

Waterloo Gasoline Engine Co., Waterloo, Ia.

Weber Engine Co., Kansas City, Mo.

West Chester Engine Co., West Chester, Pa.

***WESTINGHOUSE ELECTRIC & MFG. CO.**,
 East Pittsburgh, Pa...*pp. 114, 115*

Witte Engine Works, Kansas City, Mo.

Wolverine Motor Works, Bridgeport, Conn.

***WORTHINGTON PUMP & MACHINERY
 CORP'N**, 115 Broadway, New York...*pp.*
30, 117, 431, 447

Wright Machine Co., Owensboro, Ky.

Eng

ENGINES (Continued)**—Hoisting**

American Hoist & Derrick Co., St. Paul, Minn.
Buffalo Contractors Plant Corp'n, 129 Erie St.,
Buffalo, N. Y.
Chase Machine Co., 2313 Elm St., N. W.,
Cleveland, O.

*CLYDE IRON WORKS, 29th Ave., W., &
Michigan St., Duluth, Minn... *p. 268*
Connellsville Mfg. & Mine Supply Co., Connells-
ville, Pa.

Crawford & McCrimmon Co., Brazil, Ind.
Dake Engine Co., Grand Haven, Mich.
Enterprise Machinery Co., Minneapolis, Minn.
Erie Hoist Co., 2101 Holland St., Erie, Pa.
Exeter Machine Works, Pittston, Pa.
FLORY MFG. CO., S., Bangor, Pa... *p. 269*
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Hendrie & Bolthoff Mfg. & Supply Co., 1635
17th St., Denver, Colo.

Hettinger Engine Co., Bridgetown, N. J.
HOLMES & BROS., ROBT., Danville, Ill... *p. 270*

*HUNT CO., INC., C. W., West New Brighton,
Staten Island, N. Y... *p. 252, 253*

Lambert Hoisting Engine Co., 115 Poinier St.,
Newark, N. J.

Lausen-Lawton Co., DePere, Wis.
*LIDGERWOOD MFG. CO., 96 Liberty St.,
New York... *p. 271*

Litchfield Foundry & Machine Co., Litchfield,
Ill.

Miloholland Co., J. & J. B., 718 Fifth Ave.,
Pittsburgh, Pa.

NORDBERG MFG. CO., Milwaukee, Wis.
... *p. 19*

Orr & Sembower, Reading, Pa.

Ottumwa Iron Works, Ottumwa, Ia.

Shannon & Co., J. Jacob, 1744 Market St.,
Philadelphia, Pa.

Thomas Elevator Co., 22 South Hoyne Ave.,
Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.

WELLMAN-SEEVER-MORGAN CO., 7000
Central Ave., Cleveland, O... *p. 272*

—Hoisting, Geared

Byers Machine Co., John F., Ravenna, O.

*CLYDE IRON WORKS, 29th Ave., W., &
Michigan St., Duluth, Minn... *p. 268*

*HUNT CO., INC., C. W., West New Brighton,
Staten Island, N. Y... *p. 252, 253*

NOVO ENGINE CO., Lansing, Mich... *p. 444, 445*

—Kerosene

American-Blakeslee Mfg. Co., Birmingham,
Ala.

Benninghofen Sons, C., Hamilton, O.

Brownwall Engine & Pulley Co., 12 W. 4th St.,
Holland, Mich.

Burlingame, S. F., W. Boylston St., Worcester,
Mass.

Burnoil Engine Co., South Bend, Ind.

Charter Gas Engine Co., Sterling, Ill.

Climax Engineering Co., Clinton, Ia.

Cook Motor Co., Delaware, O.

*DE LA VERGNE MACHINE CO., 1123 E.
138th St., New York... *p. 28*

Domestic Engine & Pump Co., Shippensburg,
Pa.

Enterprise Machinery Co., Minneapolis, Minn.

Field-Brundage Co., Jackson, Mich.

Foos Gas Engine Co., Springfield, O.

Fuller & Johnson Mfg. Co., Madison, Wis.

Gade Bros. Mfg. Co., Iowa Falls, Ia.

Lausen-Lawton Co., DePere, Wis.

Lauson Mfg. Co., John, New Holstein, Wis.

Lennox Machine Co., 2558 W. 16th St., Chicago,
Ill.

Middletown Machine Co., Middletown, O.

Mietz Corp'n, August, 128 Mott St., New York

Minneapolis Steel & Machinery Co., 29th &
Minnehaha Ave., Minneapolis, Minn.

"New-Way" Motor Co., Lansing, Mich.

NOVO ENGINE CO., Lansing, Mich... *p. 444, 445*

Regal Gasoline Engine Co., Coldwater, Mich.

Reliance Engineering Co. (Olds), Lansing,
Mich.

Remington Oil Engine Co., Stamford, Conn.

Standard Oil Engine Co., 130 Seaview Ave.,
Bridgeport, Conn.

Steiner & Co., M., 242 Torrence St., Dayton, O.

Strang Engine Co., Harvey, Ill.

Termaat & Monahan Mfg. Co., Oshkosh, Wis.

Union Gas Engine Co., Oakland, Cal.

United Engine Co., Lansing, Mich.

Weber Engine Co., Kansas City, Mo.

West Chester Engine Co., West Chester, Pa.

Wolverine Motor Works, Bridgeport, Conn.

Wright Machine Co., Owensboro, Ky.

—Marine

American Engine Co., 2nd & Amsterdam Ave.,
Detroit, Mich.

American Whale Engine Co., 136 Federal St.,
Boston, Mass.

Anderson Engine Co., 4036 N. Rockwell St.,
Chicago, Ill.

Baltimore Oil Engine Co., P. O. B. 100 High-
landtown, Baltimore, Md.

Bath Iron Works, Ltd., Bath, Me.

Bay State Iron Works, Erie, Pa.

Bolinders Co., 30 Church St., New York

Boston Engineering Co., India Wharf, Boston,
Mass.

Bound Brook Engine & Mfg. Co., Bound Brook,
N. J.

Buffalo Gasoline Motor Co., 1280-1290 Niagara
St., Buffalo, N. Y.

Burnoil Engine Co., South Bend, Ind.

BUSCH-SULZER BROS.-DIESEL ENGINE
CO., St. Louis, Mo... *p. 23*

Carbone & Co., A., 114 Centre St., New York

Clay Engine Co., 6950 Kinsman Road, Clevel-
and, O.

Craig Engine & Machine Works, James, 807
Garfield Ave., Jersey City, N. J.

Dominion Bridge Co., Montreal, P. Q., Canada

Evansville Gas Engine Works, Evansville, Ind.

Fay & Bowen Engine Co., Geneva, N. Y.

Ferro Machine & Foundry Co., Cleveland, O.

Fitchburg Steam Engine Co., Fitchburg, Mass.

Fulton Mfg. Co., 12th & Cranberry Sts., Erie,
Pa.

Gas Engine & Power Co., and Charles L. Sea-
bury & Co., Cons., Morris Heights, New York

Great Lakes Engineering Works, Detroit, Mich.

Hall Gas Engine Co., Bridesburg, Philadelphia,
Pa.

Hardie-Tynes Mfg. Co., Birmingham, Ala.

Hooven-Owens-Rentschler Co., Hamilton, Ohio

Inglis, Co., Ltd., John, Toronto, Ont., Canada

JACOBSON ENGINEERING CO., Albany,
N. Y... *p. 31*

JOHNSON MACHINE CO., CARLYLE, Man-
chester, Conn... *p. 209*

Kahlenberg Bros. Co., Two Rivers, Wis.

MCINTOSH & SEYMOUR CORP'N, Auburn,
N. Y... *p. 25*

Mietz Corp'n, August, 128 Mott St., New York

*MORRIS MACHINE WORKS, Baldwinville,
N. Y... *p. 442, 443*

Page Engineering Co., Foot Latrobe Park,
Baltimore, Md.

Providence Engineering Corp'n, Providence,
R. I.

Rees & Sons Co., James, Pittsburgh, Pa.

Regal Gasoline Engine Co., Coldwater, Mich.

Roberts Motor Mfg. Co., Sandusky, O.

Sheffield Car Co., Three Rivers, Mich.

Standard Fuel Oil Engine Co., Willoughby, O.

Standard Gas Engine Co., East Oakland, Cal.

Strang Engine Co., Harvey, Ill.

Tampa Shipbuilding & Engineering Co., Tampa,
Fla.

Union Gas Engine Co., Oakland, Cal.

Universal Motor Co., Oshkosh, Wis.

Vulcan Iron Works, Inc., Jersey City, N. J.

WARD ENGINEERING WORKS, CHARLES,
Charleston, W. Va... *p. 65*

Weiss Engine Co., 17 Battery Place, New York

Western Machinery Co., 900 N. Main St., Los
Angeles, Cal.

Eng

*WESTINGHOUSE ELECTRIC & MFG. CO.,
East Pittsburgh, Pa. . . *p. 114, 115*
Wolverine Motor Works, Bridgeport, Conn.

—**Naphtha**

Field-Brundage Co., Jackson, Mich.

—**Oil**

*ALLIS-CHALMERS MFG. CO., Milwaukee,
Wis. . . *p. 15*

American Whaley Engine Co., 136 Federal St.,
Boston, Mass.

ANDERSON FOUNDRY & MACHINE
WORKS, Anderson, Ind. . . *p. 27*

Baltimore Oil Engine Co., P. O. B. 100 High-
landtown, Baltimore, Md.

Bessemer Gas Engine Co., Grove City, Pa.

Bolinders Co., 30 Church St., New York

Buckeye Machine Co., Lima, O.

Burnoil Engine Co., South Bend, Ind.

Butler Engine & Foundry Co., Butler, Pa.

Castle Engineering Co., Inc., A. M., La Crosse,
Wis.

Charter Gas Engine Co., Sterling, Ill.

Chicago Pneumatic Tool Co., Fisher Bldg.,
Chicago, Ill.

Christensen Engineering Co., 841 40th St.,
Milwaukee, Wis.

*DE LA VERGNE MACHINE CO., 1123 E.
138th St., New York. . . *p. 28*

Dissinger & Bro., Inc., C. H. A., Wrightsville,
Pa.

Fairbanks-Morse & Co., 920 Wabash Ave.,
Chicago, Ill.

Foss Gas Engine Co., Springfield, O.

Fulton Mfg. Co., 12th & Cranberry Sts., Erie,
Pa.

International Harvester Co. of America, Har-
vester Bldg., Chicago, Ill.

JACOBSON ENGINEERING CO., Albany,
N. Y. . . *p. 31*

Johnson & Jennings Co., Cleveland, O.

Kahlenberg Bros. Co., Two Rivers, Wis.

Lane & Bodley Co., Tenn. Ave. & Paddock
Rd., Cincinnati, O.

LaZier Gas Engine Co., Buffalo, N. Y.

Lyons Atlas Co., Indianapolis, Ind.

Mann Corporation, Kankakee, Ill.

McEwen Brothers, Wellsville, N. Y.

*MCINTOSH & SEYMOUR CORP'N, Auburn,
N. Y. . . *p. 25*

Mietz Corp'n, August, 128 Mott St., New York

MUNCIE OIL ENGINE CO., 500 American
Bldv., Muncie, Ind. . . *p. 29*

NORDBERG MFG. CO., Milwaukee, Wis. . . *p. 19*

Olin Gas Engine Co., 10 Lock St., Buffalo, N. Y.

Otto Engine Mfg. Co., 33rd & Walnut Sts.,
Philadelphia, Pa.

Power Mfg. Co., Cor. Greenlawn Ave. & C. &
E. R. R., Lima, O.

Price Pump & Engine Co., G. W., 33 Stevenson
St., San Francisco, Cal.

Reid Gas Engine Co., Joseph, Oil City, Pa.

Remington Oil Engine Co., Stamford, Conn.

Standard Fuel Oil Engine Co., Willoughby, O.

Standard Oil Engine Co., 130 Seaview Ave.,
Bridgeport, Conn.

St. Marys Oil Engine Co., St. Charles, Mo.

Stover Mfg. & Engine Co., Freeport, Ill.

Union Tool Co., Torrance, Cal.

Weber Engine Co., Kansas City, Mo.

Weiss Engine Co., 17 Battery Place, New York

Western Machinery Co., 900 N. Main St., Los
Angeles, Cal.

*WORTHINGTON PUMP & MACHINERY
CORP'N, 115 Broadway, New York. . . *p. 30, 117, 431, 447*

—**Oil, Diesel**

*ALLIS-CHALMERS MFG. CO., Milwaukee,
Wis. . . *p. 15*

BUSCH-SULZER BROS.-DIESEL ENGINE
CO., St. Louis, Mo. . . *p. 23*

Craig Engine & Machine Works, James, 807
Garfield Ave., Jersey City, N. J.

*DE LA VERGNE MACHINE CO., 1123 E.
138th St., New York. . . *p. 28*

Dow Pump & Diesel Engine Co., Alameda, Cal.

FULTON IRON WORKS CO., St. Louis,
Mo. . . *p. 24*

JACOBSON ENGINEERING CO., Albany,
N. Y. . . *p. 31*

Lyons Atlas Co., Indianapolis, Ind.

*MCINTOSH & SEYMOUR CORP'N, Auburn,
N. Y. . . *p. 25*

National Transit Pump & Machine Co., Oil City,
Pa.

NEW LONDON SHIP & ENGINE CO., Gro-
ton, Conn. . . *p. 26*

NORDBERG MFG. CO., Milwaukee, Wis. . . *p. 19*

SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington St., Philadelphia, Pa. . . *p. 456*

—**Pumping**

Ajax Iron Works, Corry, Pa.

*ALLIS-CHALMERS MFG. CO., Milwaukee,
Wis. . . *p. 15*

Augustine Automatic Rotary Engine Co., 1862
Elmwood Ave., Buffalo, N. Y.

Carbone & Co., A., 114 Centre St., New York

DE LAVAL STEAM TURBINE CO., Trenton,
N. J. . . *p. 22*

Edson Mfg. Co., 257 Atlantic Ave., Boston,
Mass.

EPPING-CARPENTER PUMP CO., Pitts-
burgh, Pa. . . *p. 441*

Fuller & Johnson Mfg. Co., Madison, Wis.

Hydraulic Gas Power Co., Foot So. Phelps St.,
Youngstown, O.

Luitwieler Pumping Engine Co., 123 Ames St.,
Rochester, N. Y.

McGowan Co., John H., Cincinnati, O.

MURRAY IRON WORKS CO., Burlington,
Ia. . . *p. 54, 55*

National Transit Pump & Machine Co., Oil City,
Pa.

NORDBERG MFG. CO., Milwaukee, Wis. . . *p. 19*

PLATT IRON WORKS, Dayton, O. . . *p. 446*

Prescott Co., Manominee, Mich.

Standard Pump & Engine Co., Akron, O.

Strang Engine Co., Harvey, Ill.

Termaat & Monahan Mfg. Co., Oshkosh, Wis.

*WORTHINGTON PUMP & MACHINERY
CORP'N, 115 Broadway, New York. . . *p. 30, 117, 431, 447*

—**Steam**

American & British Mfg. Co., Bridgeport,
Conn.

Augustine Automatic Rotary Engine Co., 1862
Elmwood Ave., Buffalo, N. Y.

AUTOMATIC FURNACE CO., Dayton, O.
. . . *p. 78*

Avery Co., Peoria, Ill.

Bay State Iron Works, Erie, Pa.

Brunswick Refrigerating Co., New Brunswick,
N. J.

Buckeye Engine Co., Salem, O.

Butler Engine & Foundry Co., Butler, Pa.

Chandler & Taylor Co., Indianapolis, Ind.

*CLYDE IRON WORKS, 29th Ave., W. &
Michigan St., Duluth, Minn. . . *p. 268*

Dake Engine Co., Grand Haven, Mich.

Enterprise Co., Columbiana, Ohio

Goldie & McCulloch Co., Ltd., Galt, Ont.,
Canada

*GREEN FUEL ECONOMIZER CO., 90 West
St., New York. . . *p. 73*

Hewes & Phillips Iron Works, Newark, N. J.

Knowlson & Kelly, Troy, N. Y.

Lawrence Machine Co., Lawrence, Mass.

Liddell Co., Charlotte, N. C.

Llewellyn Iron Works, Los Angeles, Cal.

Lucey Mfg. Corp'n, Woolworth Bldg., New
York

Machold & Riddell, 1020 Stephen Girard Bldg.,
Philadelphia, Pa.

Mecklenburg Iron Works, Charlotte, N. C.

National Supply Co., 136 Huron St., Toledo,
Ohio

Eng

ENGINES (Continued)**—Steam**OIL CITY BOILER WORKS, Oil City, Pa...
p. 58Oil Well Supply Co., 213-215 Water St., Pitts-
burgh, Pa.

Orr & Sembower, Reading, Pa.

Providence Engineering Corp'n, Providence, R. I.

Randle Machinery Co., Cincinnati, O.

Ridgway Dynamo & Engine Co., Ridgway, Pa.

Southern Engine & Boiler Works, Jackson,
Tenn.**—Steam, Automatic**AMERICAN BLOWER CO., Detroit, Mich...
pp. 434, 435

*BALL ENGINE CO., Erie, Pa... p. 16

Bound Brook Engine & Mfg. Co., Bound Brook,
N. J.

Dutton Co., C. H., Kalamazoo, Mich.

Erie Engine Works, Erie, Pa.

Fitchburg Steam Engine Co., Fitchburg, Mass.

FROST MFG. CO., 112 Adams St., Chicago,
Ill... pp. 47, 462Granger Co., A. D., 15 Park Row, New York
Harrisburg Foundry & Machine Works, Harris-
burg, Pa.HOUSTON, STANWOOD & GAMBLE CO.,
Cincinnati, O... pp. 48, 49, 321

Ide & Sons, A. L., Springfield, Ill.

*LEFFEL & CO., JAMES, Springfield, O... p.
453MURRAY IRON WORKS CO., Burlington,
Ia... pp. 54, 55

Nagle Engine & Boiler Works, Erie, Pa.

Olmstead & Sons, A. E., Pulaski, N. Y.

Peer Mfg. Co., Comstock, Mich.

PHOENIX IRON WORKS CO., Meadville,
Pa... p. 497

Reeves Engineering Co., Trenton, N. J.

Rollins Engine Co., Nashua, N. H.

Schofield's Sons Co., J. S., Macon, Ga.

SKINNER ENGINE CO., Erie, Pa... p. 17

STURTEVANT CO., B. F., Hyde Park, Boston,
Mass... pp. 74, 75

Troy Engine & Machine Co., Troy, Pa.

*WESTINGHOUSE ELECTRIC & MFG. CO.,
East Pittsburgh, Pa... pp. 114, 115**—Steam, Corliss***ALLIS-CHALMERS MFG. CO., Milwaukee,
Wis... p. 15

*BALL ENGINE CO., Erie, Pa... p. 16

BASS FOUNDRY & MACHINE CO., Fort
Wayne, Ind... p. 35Birmingham Machine & Foundry Co., Birming-
ham, Ala.

Brown Engine Co., Fitchburg, Mass.

Chuse Engine & Mfg. Co., Mattoon, Ill.

Clark Bros. Co., Olean, N. Y.

Cooper Co., C. & G., Mt. Vernon, O.

Erie City Iron Works, Erie, Pa.

Filer & Stowell Co., Milwaukee, Wis.

Franklin Machine Co. (Harris), 189 Charles St.,
Providence, R. I.FULTON IRON WORKS CO., St. Louis, Mo.
p. 24

Granger Co., A. D., 15 Park Row, New York

Griffith & Wedge Co., Zanesville, O.

Hardie-Tynes Mfg. Co., Birmingham, Ala.

Hewes & Phillips Iron Works, Newark, N. J.

Hooven, Owens, Rentschler Co., Hamilton, O.

Ide & Sons, A. L., Springfield, Ill.

Lane & Bodley Co., Tenn. Ave. & Paddock Rd.,
Cincinnati, O.

Mesta Machine Co., Box 1124, Pittsburgh, Pa.

MURRAY IRON WORKS CO., Burlington,
Ia... pp. 54, 55

Nagle Corliss Engine Works, Erie, Pa.

NORDBERG MFG. CO., Milwaukee, Wis... p.
19Providence Engineering Corp'n (Rice & Sargent),
Providence, R. I.Robb Engineering Works, Ltd., Amherst, N. S.,
Canada

Rollins Engine Co., Nashua, N. H.

St. Louis Iron & Machine Works, 126 Chouteau
Ave., St. Louis, Mo.

Strait Mfg. Co., H. N., Kansas City, Mo.

*VILTER MFG. CO., 1194-1196 Clinton St.,
Milwaukee, Wis... p. 18Wetherill & Co., Inc., Robt. (Dept. of Sun
Shipbuilding Co.), Chester, Pa.**—Steam, High Speed**AMERICAN BLOWER CO., Detroit, Mich...
pp. 434, 435

Ames Iron Works, Oswego, N. Y.

*BALL ENGINE CO., Erie, Pa... p. 16

Bound Brook Engine & Mfg. Co., Bound Brook,
N. J.

Brownell Co., Dayton, O.

Engoerg's Electric & Mechanical Works, 8
Vine St., St. Joseph, Mich.

Fitchburg Steam Engine Co., Fitchburg, Mass.

FULTON IRON WORKS CO., St. Louis, Mo.
p. 24HOUSTON STANWOOD & GAMBLE CO.,
Cincinnati, O... pp. 48, 49, 321

Ide & Sons, A. L., Springfield, Ill.

*MORRIS MACHINE WORKS, Baldwins-
ville, N. Y... pp. 442, 443NORDBERG MFG. CO., Milwaukee, Wis...
19PHOENIX IRON WORKS CO., Meadville,
Pa... p. 497Providence Engineering Corp'n, Providence,
R. I.Robb Engineering Works, Ltd., Amherst, N. S.,
Canada

Shepherd Engineering Co., Williamsport, Pa.

SKINNER ENGINE CO., Erie, Pa... p. 17

STURTEVANT CO., B. F., Hyde Park, Bos-
ton, Mass... pp. 74, 75

Troy Engine & Machine Co., Troy, Pa.

*VILLER MFG. CO., 1194-1196 Clinton St.,
Milwaukee, Wis... p. 18**—Steam, Poppet Valve**

Chuse Engine & Mfg. Co., Mattoon, Ill.

NORDBERG MFG. CO., Milwaukee, Wis...
p. 19*VILTER MFG. CO., 1194-1196 Clinton St.,
Milwaukee, Wis... p. 18**—Steam, Throttling**

*BALL ENGINE CO., Erie, Pa... p. 16

COLE MFG. CO., R. D., Newnan, Ga... p. 41

Corinth Machinery Co., Corinth, Miss.

FROST MFG. CO., 112 W. Adams St., Chicago,
Ill... pp. 47, 462

Godfrey, Keeler Co., 70 Warren St., New York

HOUSTON, STANWOOD & GAMBLE CO.,
Cincinnati, O... pp. 48, 49, 321Lane & Bodley Co., Tenn. Ave. & Paddock Rd.,
Cincinnati, O.*LEFFEL & CO., JAMES, Springfield, O... p.
453*MORRIS MACHINE WORKS, Baldwins-
ville, N. Y... pp. 442, 443MURRAY IRON WORKS CO., Burlington,
Ia... pp. 54, 55

Nagel Engine & Boiler Works, Erie, Pa.

OIL CITY BOILER WORKS, Oil City, Pa...
p. 58

Schofield's Sons Co., J. S., Macon, Ga.

Troy Engine & Machine Co., Troy, Pa.

Wachs Co., E. H., 1525 Dayton St., Chicago
Ill.**—Steam, Uniflow**

Ames Iron Works, Oswego, N. Y.

Chuse Engine & Mfg. Co., Mattoon, Ill.

Filer & Stowell Co., Milwaukee, Wis.

NORDBERG MFG. CO., Milwaukee, Wis...
p. 19

Reeves Engineering Co., Trenton, N. J.

SKINNER ENGINE CO., Erie, Pa... p. 17

—Steam, Variable Speed

*BALL ENGINE CO., Erie, Pa... p. 16

Soule Steam Feed Works, Meriden, Miss.

Steering*LIDGERWOOD MFG. CO., 96 Liberty St.,
New York... p. 271

Eng

Waters Co., Geo. H., West New Brighton, N. Y.

—**Swinging**

Chase Machine Co., 2313 Elm St., N. W., Cleveland, O.

*CLYDE IRON WORKS, 29th Ave. W. & Michigan St., Duluth, Minn...*p. 268*

FLORY MACHINE CO., S., Bangor, Pa...*p. 269*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York...*p. 271*

Superior Iron Works Co., Superior, Wis.

—**Traction**

*ALLIS-CHALMERS MFG. CO., Milwaukee, Wis...*p. 15*

Anderson Engine Co., 4036 N. Rockwell St., Chicago, Ill.

Buffalo Gasoline Motor Co., 1280-1290 Niagara St., Buffalo, N. Y.

Buffalo Pitts Co., Buffalo, N. Y.

Eagle Mfg. Co., Appleton, Wis.

Enterprise Machinery Co., Minneapolis, Minn.

Farquhar Co., Ltd., A. B., York, Pa.

Holt Mfg. Co., Stockton, Cal.

Holt Mfg. Co., Peoria, Ill.

Russell & Co., Massillon, O.

Waterloo Gasoline Engine Co., Waterloo, Ia.

—**ENGRAVING MACHINES**

Gorton Machine Co., George, Racine, Wis.

—**ENVELOPE MACHINERY**

Bickett Machine & Mfg. Co., Cincinnati, O.

Schmidt Co., F. L., 150 11th St., New York

—**ESCALATORS**

BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill...*p. 262*

—**EVAPORATORS**

BADGER & SONS, E. B., Boston, Mass...*p. 159*

Buffalo Foundry & Machine Co., E. Perry St. & Fillmore Ave., Buffalo, N. Y.

Columbus Iron Works Co., 50 Broad St., New York

*HODGES WATER STILL CO., INC., 1234 Callowhill St., Philadelphia, Pa...*p. 500*

International Process Co., 5 Beekman St., New York

Kilby Mfg. Co., Cleveland, O.

Locomotive Feed Water Heater Co., 30 Church St., New York

Sanborn Evaporator Co., 50 Broad St., New York

Stocker, George J., St. Louis, Mo.

—**Crystallizing**

SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill...*p. 501*

Zaremba Co., 506 Niagara Life Bldg., Buffalo, N. Y.

—**High Density**

Kestner Evaporator Co., 18th St. & Allegheny Ave., Philadelphia, Pa.

SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill...*p. 501*

Zaremba Co., 506 Niagara Life Bldg., Buffalo, N. Y.

—**Multiple**

*CASEY-HEDGES CO., Chattanooga, Tenn...*pp. 42, 43*

Griscom-Russell Co., 90 West St., New York

Kestner Evaporator Co., 18th St. & Allegheny Ave., Philadelphia, Pa.

Louisville Drying Machinery Co., 451 Baxter Ave., Louisville, Ky.

Oats & Son, Jos., 232 Quarry St., Philadelphia, Pa.

Philadelphia Coppersmithing Co., 222-226 N. Front St., Philadelphia, Pa.

PHOENIX IRON WORKS CO., Meadville, Pa...*p. 497*

Sanborn Evaporator Co., 50 Broad St., New York

Standard Water Systems Co., Hampton, N. J.

SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill...*p. 501*

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p. 116*

Zaremba Co., 506 Niagara Life Bldg., Buffalo, N. Y.

—**Salt**

WILLCOX ENGINEERING CO., Saginaw, Mich...*p. 516*

—**Sugar**

*CASEY-HEDGES CO., Chattanooga, Tenn...*pp. 42, 43*

Honolulu Iron Works Co., Honolulu, T. H.

Kestner Evaporator Co., 18th St. & Allegheny Ave., Philadelphia, Pa.

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa...*p. 496*

Murphy Iron Works, John H., New Orleans, La.

Oats & Son, Jos., 232 Quarry St., Philadelphia, Pa.

PHOENIX IRON WORKS CO., Meadville, Pa...*p. 497*

SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill...*p. 501*

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p. 116*

—**EXCAVATING MACHINERY**

*BALL ENGINE CO., Erie, Pa...*p. 16*

BLAW-KNOX CO., Pittsburgh, Pa...*p. 489*

Browning Co., Cleveland, O.

Bucyrus Co., South Milwaukee, Wis.

Castle Engineering Co., Inc., A. M., La Crosse, Wis.

Charter Gas Engine Co., Sterling, Ill.

*CLYDE IRON WORKS, 29th Ave. W. & Michigan St., Duluth, Minn...*p. 268*

Dull Co., Raymond W., 111 W. Washington St., Chicago, Ill.

Gade Bros. Mfg. Co., Iowa Falls, Ia.

Hayward Co., 50 Church St., New York

*LIDGERWOOD MFG. CO., 96 Liberty St., New York...*p. 271*

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill...*p. 256*

Marion Steam Shovel Co., Marion, O.

Monighan Machine Co., 2024 Carroll Ave., Chicago, Ill.

Potter Mfg. Co., 3511 E. Washington St., Indianapolis, Ind.

Sauerman Bros., 1141 Monadnock Block, Chicago, Ill.

Thew Automatic Shovel Co., Lorain, Ohio

Toledo Foundry & Machine Co., Toledo, O.

Union Iron Works, Newark Ave. & Monroe St., Hoboken, N. J.

Wickes Bros., Saginaw, Mich.

—**Sewer**

*BALL ENGINE CO., Erie, Pa...*p. 16*

Parsons Co., Newton, Iowa

—**EXHAUST FANS**

(See Fans, Exhaust)

—**EXHAUST HEADS**

Boston Steam Specialty Co., 185 Franklin St., Boston, Mass.

Burt Mfg. Co., Akron, O.

Colles Heater & Specialty Co., 14 E. Jackson Blvd., Chicago, Ill.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*

Direct Separator Co., Syracuse, N. Y.

Godfrey, Keeler Co., 70 Warren St., New York

KIELEY & MUELLER, INC., 34 W. 13th St., New York...*p. 146*

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa...*p. 496*

Nightingale & Childs Co., 205 Congress St., Boston, Mass.

Pittsburgh Gage & Supply Co., Pittsburgh, Pa.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa...*pp. 132, 133*

SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo...*p. 476*

EXHAUST HEADS (Continued)

Sorge, Jr., & Co., A., Monadnock Block, Chicago, Ill.
 STURTEVANT CO., B. F., Hyde Park, Boston, Mass... pp. 74, 75
 WILLIAMS, INC., FRANKLIN, 41 Cortlandt St., New York... p. 161
 Wright-Austin Co., 90 Woodbridge St., Detroit, Mich.

EXHAUST OUTLETS

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... pp. 104, 105
 MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... p. 496

EXHAUST SYSTEMS

Allington & Curtis Mfg. Co., 400 Holden St., Saginaw, Mich.
 AMERICAN BLOWER CO., Detroit, Mich... pp. 434, 435
 Cyclone Blow Pipe Co., 2552 W. 21st St., Chicago, Ill.
 SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... p. 476
 STERLING BLOWER CO., Hartford, Conn... p. 436

EXHAUSTERS, GAS

Connersville Blower Co., Connersville, Ind.
 *GENERAL ELECTRIC CO., Schenectady, N. Y... pp. 20, 21, 521
 *GREEN FUEL ECONOMIZER CO., 90 West St., New York... p. 73
 Indiana Fan Co., 40 E. South St., Indianapolis, Ind.

Piqua Blower Co., Piqua, O.
 Roota Co., P. H. & F. M., Connersville, Ind.
 STURTEVANT CO., B. F., Hyde Park, Boston, Mass... pp. 74, 75
 WILBRAHAM-GREEN BLOWER CO., Pottstown, Pa... p. 437

EXPANDERS, BOILER TUBE

Faessler Mfg. Co., J., Moberly, Mo.
 Henderer's Sons, A. L., Wilmington, Del.

EXPANSION BOLTS, JOINTS, ETC.

(See Bolts, Joints, etc., Expansion)

EXPERIMENTAL WORK

AKRON METALLIC GASKET CO., 152 N. Union St., Akron, O... p. 177
 AMERICAN TOOL & MACHINE CO., Boston, Mass... p. 490
 Blount Engineering Co., 100 High St., Boston, Mass.
 BURROUGHS CO., CHARLES, Newark, N. J... p. 454
 Custer Specialty Co., 26-28 N. Ludlow St., Dayton, O.
 Emery, A. H., Maple Ave., Glenwood, Conn.
 Hart & Co., Inc., Frederick, 837 Main St., Poughkeepsie, N. Y.
 *PRECISION INSTRUMENT CO., Detroit, Mich... p. 524
 Winchester Repeating Arms Co., New Haven, Conn.
 Wunsch & Washburn, 207 Centre St., New York

EXPLOSIVES APPARATUS

Downington Mfg. Co., West Downingtown, Pa.
 Luther Mfg. Co., Olean, N. Y.

EXTRACTORS

Dienelt & Eisenhardt, Inc., 1304 N. Howard St., Philadelphia, Pa.
 Sanborn Evaporator Co., 50 Broad St., New York

—Centrifugal

AMERICAN TOOL & MACHINE CO., Boston, Mass... p. 490
 DE LAVAL STEAM TURBINE CO., Trenton, N. J... p. 22
 SCHAUM & UHLINGER, INC., Glenwood Ave. at Second St., Philadelphia, Pa... pp. 492, 493
 Tolhurst Machine Works, Troy, N. Y.

—Hydro

AMERICAN TOOL & MACHINE CO., Boston, Mass... p. 490
 SCHAUM & UHLINGER, INC., Glenwood Ave. at Second St., Philadelphia, Pa... pp. 492, 493
 Tolhurst Machine Works, Troy, N. Y.

—Oil and Grease

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... pp. 142, 143
 Andrews, Inc., William, 120 Liberty St., New York
 BARTLETT & SNOW CO., C. O., Cleveland, O... p. 249

Beggs & Co., James, 36 Warren St., New York
 Blackburn-Smith Corp'n, 105 W. 40th St., New York
 Boston Steam Specialty Co., 185 Franklin St., Boston, Mass.

Jacobs & Co., Charles (Lowden), 258 Franklin St., Boston, Mass.
 KIELEY & MUELLER, INC., 34 W. 13th St., New York... p. 146

Kutztown Foundry & Machine Co., 1421 Chestnut St., Philadelphia, Pa.
 Lagoda Mfg. Co., Springfield, O.
 National Separator & Machine Co., 89 State St., Boston, Mass.

PHOENIX IRON WORKS CO., Meadville, Pa... p. 497
 SIMMONS CO., JOHN, 110 Center St., New York... p. 515

STEELE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... p. 503

—Screw

CLEVELAND TWIST DRILL CO., Cleveland, O... p. 378

—Tar

Smith Gas Engineering Co., Lexington, O.

EXTRUDED METALS

(See Metals, Extruded)

F**FABRIC COATING MACHINES**

AMERICAN TOOL & MACHINE CO., Boston, Mass... p. 490

FACE-PLATE JAWS (Portable)

Cushman Chuck Co., Hartford, Conn.
 HOGGSON & PETTIS MFG. CO., New Haven, Conn... pp. 394, 395, 396

FACING HEADS

INTERNATIONAL MACHINE TOOL CO., 1124 W. 21st St., Indianapolis, Ind... pp. 322, 323

FACINGS**—Clutch**

Cork Insert Co., 164 Federal St., Boston, Mass.
 Hide, Leather & Belting Co. (Leathertex), Indianapolis, Ind.

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... p. 162

—Foundry

Hill & Griffith Co., Box 540, Birmingham, Ala.
 WOODISON CO., E. J., Detroit, Mich... p. 463

FANS, EXHAUST

AMERICAN BLOWER CO., Detroit, Mich... pp. 434, 435
 Backus Water Motor Co., 172-182 Pennsylvania Ave., Newark, N. J.
 Barney Ventilating Fan Works, 19 Chardon St., Boston, Mass.
 Bicalky Fan Co., 866 Prospect Ave., Buffalo, N. Y.
 Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
 Cleveland Blow Pipe & Mfg. Co., 6302 Kinsman Road, Cleveland, O.
 Colonial Fan & Motor Co., Warren, O.
 COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass... pp. 76, 77

Exh

Cyclone Blow Pipe Co., 2552 W. 21st St., Chicago, Ill.
DE LAVAL STEAM TURBINE CO., Trenton, N. J., *p. 22*
 Dixie Mfg. Co., Inc., Russell St. & B. & O. R. R., Baltimore, Md.
 Eck Dynamo & Motor Co., Belleville, N. J.
 Electric Blower Co., 352 Atlantic Ave., Boston, Mass.
 Fidelity Electric Co., Lancaster, Pa.
 Garden City Fan Co., McCormick Bldg., Chicago, Ill.
 ***GREEN FUEL ECONOMIZER CO.**, 90 West St., New York... *p. 73*
 Indiana Fan Co., 40 E. South St., Indianapolis, Ind.
 Kimble Electric Co., 634 N. Western Ave., Chicago, Ill.
 Meadon's Blower & Pipe Works, 23-27 Messerole Ave., Brooklyn, N. Y.
 Mechanical Appliance Co., Milwaukee, Wis.
 National Blow Pipe & Mfg. Co., 738 Dryades St., New Orleans, La.
 Perkins & Son, B. F., Holyoke, Mass.
PHILADELPHIA DRYING MACHINERY CO., Stokely St., Philadelphia, Pa... *p. 473*
 Pullman Ventilator and Mfg. Co., 205 W. York Ave., York, Pa.
SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York... *p. 505*
 Seymour, Jr., J. M., 51-53 Lawrence St., Newark, N. J.
SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... *p. 476*
 Stratton & Bragg Co., Petersburg, Va.
 ***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa... *pp. 114, 115*
 Zellweger & Sons, J., 1900 Adelaide Ave., St. Louis, Mo.
 —**Mine**
AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*
 Connellville Mfg. & Mine Supply Co., Connellsville, Pa.
 Crawford & McCrimmon Co., Brazil, Ind.
 Diehl Mfg. Co., Elizabethport, N. J.
 Dixie Mfg. Co., Inc., Russell St. & B. & O. R. R., Baltimore, Md.
 ***GREEN FUEL ECONOMIZER CO.**, 90 West St., New York... *p. 73*
 Ottumwa Iron Works, Ottumwa, Ia.
 Sine Co., J. C., Tyrone, Pa.
STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*
 Western Blower Co., 1800 9th Ave., South, Seattle, Wash.
 ***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa... *pp. 114, 115*
FAUCETS, TANK WAGON
MORRISON BROS., Dubuque, Ia... *p. 495*
FEED WATER CIRCULATORS, HEATERS, REGULATORS, ETC.
 (See Circulators, Heaters, Regulators, Etc., Feed Water)
FEED WATER HEATERS AND PURIFIERS
 (See Heaters and Purifiers, Feed Water)
FEEDERS
 —**Boiler (Low Pressure)**
 Farnsworth Co., Conshohocken, Pa.
KILEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*
 Nason Mfg. Co., 71 Fulton St., New York
SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*
WEBSTER & CO., WARREN, Camden, N. J... *pp. 108, 109, 110*
 —**Chemical**
HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*
 —**Conveyor Belt**
BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

***CALDWELL & SON CO.**, H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*
 ***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill... *p. 256*
WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp. 258, 259, 260*
 —**Graphite**
 American Graphite Feeding Device Co., Manville, R. I.
 —**Pulverized Fuel**
 ***FULLER-LEHIGH CO.**, Fullerton, Pa... *p. 92*
 ***LOCOMOTIVE PULVERIZED FUEL CO.**, 30 Church St., New York... *p. 93*
STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*
FELT GOODS, MECHANICAL
 Albany Felt Co., Albany, N. Y.
 Booth Felt Co., Inc., 440-450 14th St., Brooklyn, N. Y.
FERRULES
 —**Brass**
AMERICAN BRASS CO., Waterbury, Conn... *p. 295*
 Athol Pump Co., Athol, Mass.
 Katzenstein & Co., L., 358 West St., New York
TORRINGTON MFG. CO., Torrington, Conn... *p. 483*
 —**Drawn**
 Pratt Chuck Co., Frankford, N. Y.
 —**Fibre**
AMERICAN VULCANIZED FIBRE CO., Wilmington, Del... *p. 296*
 —**Union**
 Athol Pump Co., Athol, Mass.
WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... *p. 397*
FERTILIZER MACHINERY
 American Process Co., 68 William St., New York
BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*
 ***FULLER-LEHIGH CO.**, Fullerton, Pa... *p. 92*
 ***POOLE ENGINEERING & MACHINE CO.**, Woodberry, Baltimore, Md... *pp. 196, 197*
 Pratt Engineering & Machine Co., Atlanta, Ga.
 Sackett, A. J., 5th Ave. & First St., Baltimore, Md.
 Stedman's Foundry & Machine Works, Aurora, Ind.
STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*
 Sturtevant Mill Co., Harrison Sq., Boston, Mass.
 Valk & Murdoch Co., Charleston, S. C.
 Walker & Ellicott, Wilmington, Del.
FIBRE (Vulcanized)
AMERICAN VULCANIZED FIBRE CO., Wilmington, Del... *p. 296*
 ***CONTINENTAL FIBRE CO.**, Newark, Del... *p. 297*
 Delaware Hard Fibre Co., Ltd., Wilmington, Del.
 ***DIAMOND STATE FIBRE CO.**, Bridgeport, Pa... *p. 298*
 ***JOHNS-MANVILLE CO.**, H. W., 296 Madison Ave., New York... *p. 162*
FIBRE CASE MACHINERY
 Knowlton Co., M. D., 29 Elizabeth St., Rochester, N. Y.
FILE SHARPENING MACHINES
 Abrasive Machine Co., Irvington, N. J.
FILES
ATKINS & CO., INC., E. C., Indianapolis, Ind... *p. 385*
 Hayes File Co., Detroit, Mich.
 Nicholson File Co., Providence, R. I.
 Walls Tool & Supply Co., T. P. (Valeau), 75-77 Walker St., New York

Fil

FILING AND HACKSAW MACHINES (Combined)

Extensive Mfg. Co., 90 West St., New York

FILING MACHINES**ATKINS & CO., INC.**, E. C., Indianapolis, Ind... *p. 385*Extensive Mfg. Co., 90 West St., New York
NOBLE & WESTBROOK MFG. CO., Hartford, Conn... *p. 368***Die**

Cochrane-Bly Co., Rochester, N. Y.

Extensive Mfg. Co., 90 West St., New York

Oliver Instrument Co., Adrian, Mich.

Rearwin, W. D., 341 Mill Ave., Grand Rapids, Mich.

Robinson Tool Works, Inc., Waterbury, Conn.

Saw

Wardwell Mfg. Co., 110-112 Hamilton Ave., Cleveland, O.

FILLER, IRON AND STEEL

Clark Cast Steel Cement Co., Shelton, Conn.

FILETS, LEATHER**GRATON & KNIGHT MFG. CO.**, Worcester, Mass... *p. 237*

Page Belting Co., Concord, N. H.

FILTER PRESSES

(See Presses, Filter)

FILTERING MATERIALS**CELITE PRODUCTS CO.**, 11 Broadway, New York... *p. 98*

Nightingale & Childs Co., 205 Congress St., Boston, Mass.

FILTERS**Beer and Wine**

Loew Mfg. Co., 9001 Madison Ave., N. W., Cleveland, O.

Chemical Solution

Colorado Iron Works Co., Box 989, Denver, Colo.

United Filters Corp'n, 36 Flatbush Ave. Extension, Brooklyn, N. Y.

Gravity

Power Plant Specialty Co., 1306 Monadnock Bldg., Chicago, Ill.

Roberts Filter Mfg. Co., Darby, Pa.

SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... *pp. 103, 498Oil**

Andrews, Inc., William, 120 Liberty St., New York

BLAW-KNOX CO., Pittsburgh, Pa... *p. 489*

Bonar & Co., James, 502 Park Bldg., Pittsburgh, Pa.

Boston Steam Specialty Co., 185 Franklin St., Boston, Mass.

Bousman Mfg. Co., 1153-57 Plainfield Ave., N. E., Grand Rapids, Mich.

Burt Mfg. Co., Akron, O.

Famous Filter Co., 310 N. Commercial St., St. Louis, Mo.

Flower & Co., Walter L., 312-314 S. 8th St., St. Louis, Mo.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 404***KRAUSE**, A. E., Mountain Lakes, N. J... *p. 111*

Nugent & Co., Wm. W., 146-148 W. Superior St., Chicago, Ill.

OIL & WASTE SAVING MACHINE CO., 1509 Real Estate Trust Bldg., Philadelphia, Pa... *p. 419*

Phoenix Automatic Filter Co., 315-317 6th St., Racine, Wis.

Pittsburgh Gage & Supply Co., Pittsburgh, Pa.

Power Plant Specialties, 219 Ruffner St., Lockland, O.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

Robertson Co., John F., 1001 Park Bldg., Pittsburgh, Pa.

Sims Co., Erie, Pa.

Turner Oil Filter Co., Niles, Mich.

Oil (Centrifugal)**DE LAVAL STEAM TURBINE CO.**, Trenton, N. J... *p. 22***OIL & WASTE SAVING MACHINE CO.**, 1509 Real Estate Trust Bldg., Philadelphia, Pa... *p. 419***Pressure**

Power Plant Specialty Co., 1306 Monadnock Bldg., Chicago, Ill.

Roberts Filter Mfg. Co., Darby, Pa.

SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... *pp. 103, 498Water**

American Water Softener Co., 1011 Chestnut St., Philadelphia, Pa.

Beggs & Co., James, 36 Warren St., New York

Boston Steam Specialty Co., 185 Franklin St., Boston, Mass.

***CASEY-HEDGES CO.**, Chattanooga, Tenn... *pp. 42, 43*

Detroit Steam Appliance Co., 500 Union Trust Bldg., Detroit, Mich.

Graver Tank Works, Wm., 28 E. Jackson Blvd., Chicago, Ill.

Greer Chemical Co., Chicago, Ill.

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*

Hygeia Filter Co., 338 Denton Ave., Detroit, Mich.

International Filter Co., 40 S. Dearborn St., Chicago, Ill.

Loomis-Manning Filter Distributing Co., 1421 S. 37th St., Philadelphia, Pa.

New York Continental Jewell Filtration Co., 15 Broad St., New York

Permutit Co., 440-4th Ave., New York

Pittsburgh Filter Mfg. Co., Pittsburgh, Pa.

Power Plant Specialty Co., 1306 Monadnock Bldg., Chicago, Ill.

Richmond Water Softener Co., Richmond, Ind.

Roberts Filter Mfg. Co., Darby, Pa.

Ross Valve Mfg. Co., Troy, N. Y.

***SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... *pp. 103, 498*

Watson, N. A., 2016 State St., Erie, Pa.

FILTRATION PLANTS

Loomis Manning Filter Distributing Co., 1421 S. 37th St., Philadelphia, Pa.

New York Continental Jewell Filtration Co., 15 Broad St., New York

Norwood Engineering Co., Florence, Mass.

Pittsburgh Filter Mfg. Co., Pittsburgh, Pa.

Reisert Automatic Water Purifying Co., 23 E. 26th St., New York

Roberts Filter Mfg. Co., Darby, Pa.

SCAIFE & SON CO.**, WM. B., Pittsburgh, Pa... *pp. 103, 498FIRE BRICK, HYDRANTS, SAND, ETC.**

(See Brick, Hydrants, Sand, Etc., Fire)

FIRE DEPARTMENT SUPPLIES

American-La France Fire Engine Co., Inc., Elmira, N. Y.

Barnes Co., Henry K., 234 Devonshire St., Boston, Mass.

Consumers Rubber Co., 829 Superior Ave., Cleveland, O.

Morse & Son, Inc., Andrew J., 221 High St., Boston, Mass.

FIRE DOOR FIXTURES (Automatic)

Automatic Sprinkler Co. of America, 123 William St., New York

COBURN TROLLEY TRACK MFG. CO., Holyoke, Mass... *p. 276*

Richards-Wilcox Mfg. Co., Aurora, Ill.

FIRE DOORS (Locomotive, Automatic)

Franklin Railway Supply Co., 30 Church St., New York

FIRE EXTINGUISHERS

American-La France Fire Engine Co., Inc., Elmira, N. Y.

Fil

Automatic Sprinkler Co. of America, 123 William St., New York

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*

FIRE HOSE MACHINERY

Royle & Sons, John, Paterson, N. J.

FIRE TUBE BOILERS

(See Boilers, Return and Vertical Tubular)

FITTINGS

—Acid

Eastwood Wire Mfg. Co., Belleville, N. J.
WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

—Aluminum

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa... *p. 294*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

—Ammonia

Arctic Ice Machine Co., Canton, O.
Baker Ice Machine Co., Omaha, Neb.
Buffalo Refrigerating Machine Co., 126 Liberty St., New York

*DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York... *p. 28*

Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.

Vesterdahl & Co., Karl, 90 West St., New York

*VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis... *p. 18*

VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... *p. 397*

—Compression

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

—Digester

Carthage Machine Co., Carthage, N. Y.
Eastwood Wire Mfg. Co., Belleville, N. J.
UNITED LEAD CO., 111 Broadway, New York... *p. 299*

—Drainage (Cast Iron)

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

*CENTRAL FOUNDRY CO., 90 West St., New York... *p. 155*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

LYNCHBURG FOUNDRY CO., 816 Peoples Gas Bldg., Chicago, Ill... *p. 156*

Red Wing Iron Works, Red Wing, Minn.

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Stockham Pipe & Fittings Co., Birmingham, Ala.

—Flanged

American Car & Foundry Co., 165 Broadway, New York

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

Direct Separator Co., Syracuse, N. Y.

Essex Foundry, Murray St. & Avenue D, Newark, N. J.

General Fire Extinguisher Co., 277 W. Exchange St., Providence, R. I.

Glamorgan Pipe & Foundry Co., Lynchburg, Va.

Illinois Malleable Iron Co., Chicago, Ill.

Limbirt & Co., Geo. B., 570 Fulton St., Chicago, Ill.

Lumsden & Van Stone Co., 426 First St., South Boston, Mass.

LYNCHBURG FOUNDRY CO., 816 Peoples Gas Bldg., Chicago, Ill... *p. 156*

Massillon Iron & Steel Co., Massillon, O.

Pittsburgh Piping & Equipment Co., 35th & Charlotte Sts., Pittsburgh, Pa.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Stockham Pipe & Fittings Co., Birmingham, Ala.

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

—Flanged (Steel)

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*

—Hard Rubber

GOODRICH RUBBER CO., B. F., Akron, O... *pp. 183, 242*

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*

—Hydraulic

Best Co., 3221 Spruce Way, Pittsburgh, Pa.

BUCKEYE IRON & BRASS WORKS, Dayton, O... *p. 481*

BURROUGHS CO., CHARLES, Newark, N. J... *p. 454*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

*HOLMSTEAD VALVE MFG. CO., P. O. Box 1754, Pittsburgh, Pa... *p. 126*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

Metalwood Mfg. Co., Leib & Wight Sts., Detroit, Mich.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p. 456*

Tight Joint Co., 306 E. 47th St., New York

WATSON-STILLMAN CO., 35 Church St., New York... *p. 457*

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

—Pipe

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

Essex Foundry, Murray St. & Avenue D, Newark, N. J.

Illinois Malleable Iron Co., Chicago, Ill.

Jarecki Mfg. Co., Erie, Pa.

Jefferson Union Co., Lexington, Mass.

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

Krahn Mfg. Co., 590 Clinton St., Milwaukee, Wis.

McNab & Harlin Mfg. Co., Paterson, N. J.

LESLIE CO., Lyndhurst, N. J... *p. 147*

MALLEABLE IRON FITTINGS CO., Branford, Conn... *p. 157*

McMann & Taylor Co., 104-106 John St., New York

McRae & Roberts Co., Detroit, Mich.

National Supply Co., 136 Huron St., Toledo, O.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

Pittsburgh Valve & Fittings Co., Barberton, O.

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Standard Cast Iron Pipe & Foundry Co., Bristol, Pa.

Stockham Pipe & Fittings Co., Birmingham, Ala.

Stoddard Union Co., Lockport, N. Y.

Tight Joint Co., 306 E. 47th St., New York

Walworth Mfg. Co., First & O. Sts., South Boston, Mass.

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

Fit

FITTINGS (Continued)**—Ballings**

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

MALLEABLE IRON FITTINGS CO., Branford, Conn... *p.* 157

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp.* 132, 133

SIMMONS CO., JOHN, 110 Center St., New York... *p.* 515

—Steel

BUCKEYE IRON & BRASS WORKS, Dayton, O... *p.* 481

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

Dart Mfg. Co., E. M., 136 Clifford St., Providence, R. I.

KELLY & JONES CO., Greensburg, Pa... *pp.* 130, 131

MALLEABLE IRON FITTINGS CO., Branford, Conn... *p.* 157

*PITTSBURGH VALVE FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp.* 132, 133

Shaw-Kendall Engineering Co., 120 S. Superior St., Toledo, O.

SIMMONS CO., JOHN, 110 Center St., New York... *p.* 515

STEERE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... *p.* 503

VOGT MACHINE CO., HENRY, Louisville, Ky... *p.* 63

—Union

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

KELLY & JONES CO., Greensburg, Pa... *pp.* 130, 131

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp.* 132, 133

WILFERT CO., JOHN, 258 Broadway, New York... *pp.* 136, 137

FLANGED AND DISHED HEADS

(See Heads, Flanged and Dishd)

FLANGES

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p.* 140

Bard Union Co., Inc., Norwich, Conn.

Best Co., 3221 Spruce Way, Pittsburgh, Pa.

Eastwood Wire Mfg. Co., Belleville, N. J.

Essex Foundry, Murray St. & Avenue D, Newark, N. J.

*JENKINS BROS., 80 White St., New York... *pp.* 128, 129

Pittsburgh Piping & Equipment Co., 35th & Charlotte Sts., Pittsburgh, Pa.

—Cast Steel

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

KELLY & JONES CO., Greensburg, Pa... *pp.* 130, 131

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp.* 132, 133

VOGT MACHINE CO., HENRY, Louisville, Ky... *p.* 63

—Forged Steel

American Spiral Pipe Works, Box 485, Chicago, Ill.

Ballwood Co., 30 Church St., New York

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

PENNSYLVANIA FORGE CO., Bridesburg, Philadelphia, Pa... *p.* 158

RYERSON & SON, JOSEPH T., 16th & Rockwell Sts., Chicago, Ill... *p.* 366

Scully Steel & Iron Co., P. O. Box 814, Chicago, Ill.

VOGT MACHINE CO., HENRY, Louisville, Ky... *p.* 63

—Pressed Steel

AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa... *p.* 200

BOSSERT CORP'N, Utica, N. Y... *p.* 304

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

GLASGOW IRON CO., 15th & Market Sta., Philadelphia, Pa... *p.* 68

KEELER CO. E. Williamsport, Pa... *p.* 51

WORCESTER PRESSED STEEL CO., Worcester, Mass... *p.* 305

FLANGING

GLASGOW IRON CO., 15th & Market Sta., Philadelphia, Pa... *p.* 68

FLANGING MACHINES

TOLEDO MACHINE & TOOL CO., Toledo, O... *p.* 313

FLEXIBLE JOINTS, SHAFTING, TUBING, ETC.

(See Joints, Shafting, Tubing, Etc., Flexible)

FLEXIBLE SHAFT OUTFITS, PORTABLE

Plank Flexible Shaft Machine Co., Grand Rapids, Mich.

FLOATS, COPPER

Harris & Co., Arthur, 212 Curtis St., Chicago, Ill.

Hercules Float Works, 200 Franklin St., Springfield, Mass.

MARK MFG. CO., P. O. Box G, Chicago, Ill... *p.* 160

Reliance Gauge Column Co. (Reliance), Cleveland, O.

FLOOR PLATES

BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa... *p.* 86

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

RYERSON & SON, JOSEPH T., 16th & Rockwell Sts., Chicago, Ill... *p.* 366

WASHBURN & GRANGER, 50 Church St., New York... *p.* 91

FLOOR STANDS

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p.* 250

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp.* 120, 121, 122, 123

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... *p.* 124

*HILL CLUTCH CO., Cleveland, O... *p.* 208

Master Builders Co., 606 Union Bldg., Cleveland, O.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp.* 132, 133

*WOOD'S SONS CO., T. B., Chambersburg, Pa... *pp.* 212, 213

FLOOR TREATMENTS, CONCRETE

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p.* 162

Sonneborn Sons, Inc., L., Pearl St., New York

Trus-Con Laboratories, Detroit, Mich.

FLOORING**—Acid Proof**

Barber Asphalt Paving Co., Land Title Bldg., Philadelphia, Pa.

—Asphalt

Warner-Quinlan Asphalt Co., 79 Wall St., New York

—Asphalt Mastic

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p.* 162

—Block (Asphalt)

HASTINGS PAVEMENT CO., 25 Broad St., New York... *p.* 507

—Block (Wood)

Pittsburgh Wood Preserving Co., 1053 Century Bldg., Pittsburgh, Pa.

Wyckoff Pipe & Creosoting Co., 30 E. 42nd St., New York

—Composition

Acme Asbestos Covering & Supply Co., 407 N. Ada St., Chicago, Ill.

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p.* 162

FLOUR MILLING MACHINERY

*ALLIS-CHALMERS MFG. CO., Milwaukee, Wis... *p.* 15

Sprout, Waldron & Co., Muncy, Pa.

Fit

Advertisements of firms marked * appear in The Journal, A. S. M. E.

FLUE CUTTERS

(See Cutters, Boiler Tube)

FLUE SHOP EQUIPMENT

RYERSON & SON, JOSEPH T., 16th & Rockwell Sts., Chicago, Ill... p. 366

FLUE WELDERS

Draper Mfg. Co., 2417 Wright St., Port Huron, Mich.

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... p. 456

FLUES, SMOKE

(See Breechings)

FLUX, BORON

*GENERAL ELECTRIC CO., Schenectady, N. Y... pp. 20, 21, 521

FLY WHEELS

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind... p. 35

*CALDWELL & SON CO., H. W., 17th & West-ern Ave., Chicago, Ill... p. 250

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 202, 203, 204, 205, 206

Goodnow Foundry Co., L. H., Fitchburg, Mass.

*HILL CLUTCH CO., Cleveland, O... p. 208

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... pp. 48, 49, 321

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... p. 256

*POLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md... pp. 196, 197

MURRAY IRON WORKS CO., Burlington, Ia... pp. 54, 55

Pyott Co., North Ave. & Noble St., Chicago, Ill.

*WOOD'S SONS CO., T. B., Chambersburg, Pa... p. 212, 213

FOIL, ALUMINUM

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa... p. 294

FORGES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Champion Blower & Forge Co., Lancaster, Pa.

BRADLEY & SON, INC., C. C., Syracuse, N. Y... p. 316

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... pp. 74, 75

—Hand, Portable

ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

Canedy-Otto Mfg. Co., Chicago Heights, Ill.

Furness Bros. Co., 615 W. Walnut St., Chicago, Ill.

Star Mfg. Co., New Lexington, O.

—Oil

Mircs Fuel Oil Equipment Co., Lancaster, Pa.

ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

*BEST, INC., W. N., 11 Broadway, New York... p. 411

Naudain, John E., Sparrows Point, Md.

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

—Rivet

ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

Eclipse Fuel Engrg. Co., Rockford, Ill.

Hauck Mfg. Co., 101-11th St., Brooklyn, N. Y.

Mahr Mfg. Co., Minneapolis, Minn.

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

TATE-JONES & CO., INC., Pittsburgh, Pa... pp. 416, 417

FORGING MACHINES

Billings & Spencer Co., Hartford, Conn.

Massillon Foundry & Machine Co., Massillon, O.

NATIONAL MACHINERY CO., Tiffin, O.

NAZEL ENGINEERING & MACHINE WORKS, 4040 N. 6th St., Philadelphia, Pa... p. 317

NILES-BEMENT-POND CO., 111 Broadway, New York... p. 344

Scranton & Co., 42 Church St., New Haven, Conn.

TOLEDO MACHINE & TOOL CO., Toledo, O... p. 313

WILLIAMS, WHITE & CO., Moline, Ill... p. 314

FORGING AND UPSETTING MACHINES

Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, O.

FORGINGS

Bradley Car Co., Osgood, Worcester, Mass.

Electro Steel Co., Inc., Curry Bldg., Pittsburgh, Pa.

General Drop Forge Co., 1738 Elmwood Ave., Buffalo, N. Y.

Liggett Spring & Axle Co., Monongahela, Pa.

Michigan Bolt & Nut Works, Detroit, Mich.

Tacony Steel Co., Tacony, Philadelphia, Pa.

—Die Makers

VULCAN STEAM FORGING CO., 247 Reno St., Buffalo, N. Y... p. 303

—Drop

Billings & Spencer Co., Hartford, Conn.

Cleveland City Forge & Iron Co., 45th St. & Lakeside Ave., Cleveland, O.

COLUMBUS BOLT WORKS CO., Columbus, O... p. 405

BRADLEY & SON, INC., C. C., Syracuse, N. Y... p. 316

Frost Gear & Forge Co., Jackson, Mich.

General Drop Forge Co., 1738 Elmwood Ave., Buffalo, N. Y.

Hay-Budden Mfg. Co., 254 N. Henry St., Brooklyn, N. Y.

Henry & Allen, Auburn, N. Y.

Keystone Drop Forge Works, Chester, Pa.

Ladish Drop Forge Co., Cudahy, Wis.

Merrill Bros., Maspeth, N. Y.

Moore Drop Forging Co., Springfield, Mass.

Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... p. 279

Ohio Forge Co., Cleveland, O.

Oliver Iron & Steel Co., Pittsburgh, Pa.

Page-Storms Drop Forge Co., Chicopee, Mass.

PENNSYLVANIA FORGE CO., Bridesburg, Philadelphia, Pa... p. 158

Plumb, Fayette R., Bridesburg P. O., Philadelphia, Pa.

Savage Arms Corp., Sharon, Pa.

Standard Spiral Pipe Works, 4801 S. Rockwell St., Chicago, Ill.

Steel Car Forge Co., Frick Bldg., Pittsburgh, Pa.

Tioga Steel & Iron Co., 62nd & Gray's Ave., Philadelphia, Pa.

Transue & Williams Steel & Forging Corp'n, Alliance, O.

UNION DROP FORGE CO., 358 W. Grand Ave., Chicago, Ill... p. 302

VOGT MACHINE CO., HENRY, Louisville, Ky... p. 63

Western Drop Forge Co., Marion, Ind.

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... p. 397

Winchester Repeating Arms Co., New Haven, Conn.

—Hammered

BRADLEY & SON, INC., C. C., Syracuse, N. Y... p. 316

Dyson & Son, Joseph, 4125 St. Clair Ave., Cleveland, O.

Erie Forge Co., Erie, Pa.

Johnston & Jennings Co., Cleveland, O.

Ladish Drop Forge Co., Cudahy, Wis.

McInnes Steel Co., Ltd., Corry, Pa.

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... p. 279

Nilson-Miller Co., 1300 Hudson St., Hoboken, N. J.

Ohio Forge Co., Cleveland, O.

PENNSYLVANIA FORGE CO., Bridesburg, Pa... p. 158

Steel Forgings Co., Bootherton Road, Cincinnati, O.

For

See Catalogue Section for data of firms listed in capital type

FORGINGS (Continued)**—Hammered**

UNION DROP FORGE CO., 358 W. Grand Ave., Chicago, Ill. . . *p. 302*

VULCAN STEAM FORGING CO., 247 Rano St., Buffalo, N. Y. . . *p. 303*

Winchester Repeating Arms Co., New Haven, Conn.

—Hand

BAYONNE CASTING CO., Bayonne, N. J. . . *p. 291*

Dyson & Son, Joseph, 5125 St. Clair Ave., Cleveland, O.

Keystone Drop Forge Works, Chester, Pa.

Ladish Drop Forge Co., Cudahy, Wis.

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York. . . *p. 270*

Patterson Co., W. W., 54 Water St., Pittsburgh, Pa.

PENNSYLVANIA FORGE CO., Bridesburg, Philadelphia, Pa. . . *p. 158*

Plumb, Fayette R., Bridesburg P. O., Philadelphia, Pa.

UNION DROP FORGE CO., 358 W. Grand Ave., Chicago, Ill. . . *p. 302*

Winchester Repeating Arms Co., New Haven, Conn.

—Iron and Steel

BRADLEY & SON, INC., C. C., Syracuse, N. Y. . . *p. 316*

Braeburn Steel Co., Braeburn, Pa.

Camden Forge Co., Mt. Ephraim Ave., Camden, N. J.

Crucible Steel Forge Co., 6607 Grant Ave., Cleveland, O.

Gale Mfg. Co., Albion, Mich.

General Drop Forge Co., 1738 Elmwood Ave., Buffalo, N. Y.

HOLMES & BROS., ROBT., Danville, Ill. . . *p. 270*

McDougall & Potter Co., 606-612 W. 55th St., New York

For

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York. . . *p. 279*

Ohio Forge Co., Cleveland, O.

PENNSYLVANIA FORGE CO., Bridesburg, Philadelphia, Pa. . . *p. 158*

Pittsburgh Forge & Iron Co., 1003 Penn Ave., Pittsburgh, Pa.

Pollak Steel Co., Cincinnati, O.

Reading Iron Co., Reading, Pa.

Standard Steel Works Co., Morris Bldg., Philadelphia, Pa.

Steel Car Forge Co., Frick Bldg., Pittsburgh, Pa.

Strait Mfg. Co., H. N., Kansas City, Mo.

Tindel-Morris Co., Eddystone, Pa.

Tioga Steel & Iron Co., 52nd & Gray's Ave., Philadelphia, Pa.

UNION DROP FORGE CO., 358 W. Grand Ave., Chicago, Ill. . . *p. 302*

WASHBURN & GRANGER, 50 Church St., New York. . . *p. 91*

Wharton, Jr. & Co., Inc., Wm. P. O. Box 124, Easton, Pa.

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y. . . *p. 397*

—Monel Metal

BAYONNE CASTING CO., Bayonne, N. J. . . *p. 291*

—Tool Steel

VULCAN STEAM FORGING CO., 247 Rano St., Buffalo, N. Y. . . *p. 303*

FORMING MACHINES (Automatic)

CLEVELAND AUTOMATIC MACHINE CO., Cleveland, O. . . *p. 333*

FORMS, STEEL (Concrete Construction)

BLAW-KNOX CO. (Blawforms), Pittsburgh, Pa. . . *p. 489*

FOUNDRY EQUIPMENT

ANTHONY CO., 138 West Ave., Long Island City, N. Y. . . *p. 410*

Arcade Mfg. Co., Freeport, Ill.

B & B Mfg. Co., Inc., Indianapolis, Ind.

Berkshire Mfg. Co., Cleveland, O.

Central Foundry Supply Co., Columbus, O.

Cleveland Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.

Dayton Molding Machine Co., Dayton, O.

Federal Foundry Supply Co., Cleveland, O.

Foundry Equipment Co., 1831 Columbus Road, Cleveland, O.

Hay's Sons, Sam'l W., 6907 Phipps Power Bldg., Pittsburgh, Pa.

Industrial Electric Furnace Co., 1405 Monadnock Bldg., Chicago, Ill.

Grimes Molding Machine Co., 1218 Hastings St., Detroit, Mich.

Mott Sand Blast Mfg. Co., Inc., 2-8 Frost St., Brooklyn, N. Y.

Northern Crane Works, Ltd., Walkerville, Ont., Canada

Pittsburgh Furnace Co., 707 Union Bank Bldg., Pittsburgh, Pa.

Ross, George A., 1951 W. Madison St., Chicago, Ill.

Scully-Jones Co., Chicago, Ill.

Standard Equipment Co., New Haven, Conn.

Standard Sand & Machine Co., Cleveland, O.

Tessmer Machine & Tool Co., 285-91 Rivard St., Detroit, Mich.

Whitehead Bros. Co., 537-539 W. 27th St., New York

Whiting Foundry Equipment Co., Harvey, Ill.

WOODISON CO., E. J., Detroit, Mich. . . *p. 463*

FOUNDEY FACING

(See Facings, Foundry)

FOUNDRY SUPPLIES

Asbury Graphite Mills, Asbury, Warren Co., N. J.

Central Foundry Supply Co., Columbus, O.

Cleveland Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.

Hill & Griffith Co., Box 540, Birmingham, Ala.

Obermayer Co., S., Cincinnati, O.

Whitehead Bros. Co., 537-539 W. 27th St., New York

WOODISON CO., E. J., Detroit, Mich. . . *p. 463*

FRAMES, WIRE DRAWING

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FRICTION CLUTCHES

(See Clutches, Friction)

FRICTIONS**—Fibre**

AMERICAN VULCANIZED FIBRE CO., Wilmington, Del. . . *p. 296*

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . *p. 250*

Rockwood Mfg. Co., Indianapolis, Ind.

—Paper and Iron

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . *p. 250*

Medart Patent Pulley Co., St. Louis, Mo.

FROGS AND CROSSINGS

Bethlehem Steel Co., South Bethlehem, Pa.

FUEL ECONOMIZERS, GAS PLANTS, ETC.
(See Economizers, Gas Plants, etc., Fuel)

FURNACES**—Annealing and Tempering**

American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.

American Shop Equipment Co., McCormick Bldg., Chicago, Ill.

ANTHONY CO., 138 West Ave., Long Island City, N. Y. . . *p. 410*

*BEST INC., W. N., 11 Broadway, New York . . *p. 411*

BROWN INSTRUMENT CO., Philadelphia, Pa. . . *p. 531*

Burns Hydro Carbon Burner Co., Fort Plain, N. Y.

Electric Furnace Co., Alliance, O.

Hadley, Frederick V., 50 Congress St., Boston, Mass.

KENWORTHY, INC., CHARLES F., Waterbury, Conn. . . *pp. 414, 415*

Advertisements of firms marked * appear in The Journal, A. S. M. E.

Mahr Mfg. Co., Minneapolis, Minn.
 Moyer, Albert W., Singer Bldg., New York
 ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
 Scott, C. U., Head of Wall St., Davenport, Ia.
 Standard Fuel Appliance Co., 1269 Beaufait Ave., Detroit, Mich.
 Strong, Carlisle & Hammond Co., Cleveland, O.
 Surface Combustion Co., 366-368 Gerard Ave., New York
 TATE-JONES & CO., INC., Pittsburgh, Pa... *pp. 416, 417*
 UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*
—Billet Heating
 American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.
 ANTHONY CO., 138 West Ave., Long Island City, N. Y... *p. 410*
 *BEST, INC., W. N., 11 Broadway, New York... *p. 411*
 Electric Furnace Co., Alliance, O.
 KENWORTHY, INC., CHARLES F., Waterbury, Conn... *pp. 414, 415*
 *LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York... *p. 93*
 ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
 TATE-JONES & CO., INC., Pittsburgh, Pa... *pp. 416, 417*
—Blast
 Johnson & Barry Steel Co., Inc., Birmingham, Ala.
 Mohr & Sons, John, 349-359 W. Illinois St., Chicago, Ill.
 Muskegon Boiler Works, Muskegon, Mich.
 Pollock Co., Wm. B., Youngstown, O.
—Boiler
 AUTOMATIC FURNACE CO., Dayton, O... *p. 78*
 *CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*
 Cokal Stoker Co., Chicago, Ill.
 *DETRICK CO., M. H., 549 W. Washington St., Chicago, Ill... *p. 97*
 DETROIT STOKER CO., Detroit, Mich... *p. 79*
 FLYNN & EMRICH CO., Baltimore, Md... *p. 85*
 *GREEN ENGINEERING CO., 13 Kennedy Ave., East Chicago, Ind... *pp. 80, 81*
 Improved Combustion Co., 355 Peoples Gas Bldg., Chicago, Ill.
 Keystone Stoker Co., Greenfield, Mass.
 *LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York... *p. 93*
 McKenzie Furnace Co., 647 McCormick Bldg., Chicago, Ill.
 McMillan & Co., James, 114 Clarkson Court, Chicago, Ill.
 *MURPHY IRON WORKS, Detroit, Mich... *pp. 82, 83*
 Scharf Smoke Preventer Co., Ypsilanti, Mich.
 STERLING BLOWER CO., Hartford, Conn... *p. 436*
 Underfeed Stoker Co. of America (Jones), 111 W. Monroe St., Chicago, Ill.
 UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*
 WASHBURN & GRANGER, 50 Church St., New York... *p. 91*
 Wetzel Mechanical Stoker Co., of New York, Inc., 30 Church St., New York
—Boiler (Oil Burning)
 *BEST, INC., W. N., 11 Broadway, New York... *p. 411*
 HAMMEL OIL BURNING EQUIPMENT CO., 409 Pine St., Providence, R. I... *p. 95*
—Case Hardening
 American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.
 ANTHONY CO., 138 West Ave., Long Island City, N. Y... *p. 410*
 *BEST, INC., W. N., 11 Broadway, New York... *p. 411*

Hadley, Frederick V., 50 Congress St., Boston, Mass.
 ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
 Standard Fuel Appliance Co., 1269 Beaufait Ave., Detroit, Mich.
 Strong, Carlisle & Hammond Co., Cleveland, O.
 TATE-JONES & CO., INC., Pittsburgh, Pa... *pp. 416, 417*
—Ceramic
 Didier-March Co., P. O. Box 327, Perth Amboy, N. J.
—Coal Burning
 ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
—Down-Draft
 *CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*
 Swan, John F., 10th St. & Duncannon Ave., Philadelphia, Pa.
 VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*
 WASHBURN & GRANGER, 50 Church St., New York... *p. 91*
—Dross Reducing
 KENWORTHY, INC., CHARLES F., Waterbury, Conn... *pp. 414, 415*
—Electric
 American Metallurgical Corp'n, Franklin Trust Bldg., Philadelphia, Pa.
 Barrio Metal Corp'n, 167 W. 18th St., New York
 Booth-Hall Co., 565 W. Washington Blvd., Chicago, Ill.
 BROWN INSTRUMENT CO., Philadelphia, Pa... *p. 531*
 Electric Furnace Co., Alliance, O.
 Electric Furnace Construction Co., Finance Bldg., Philadelphia, Pa.
 ENGELHARD, CHARLES, 30 Church St., New York... *p. 532*
 *GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*
 Greene Process Metal Co., 1602 Hoge Bldg., Seattle, Wash.
 Hamilton & Hansell, Inc., 13-21 Park Row, New York
 Hanovia Chemical & Mfg. Co., Chestnut St. & N. J. R. R. Ave., Newark, N. J.
 Industrial Electric Furnace Co., 1405 Monadnock Bldg., Chicago, Ill.
 Morris Engineering Co., 39 Courtlandt St., New York
 Pittsburgh Furnace Co., 707 Union Bank Bldg., Pittsburgh, Pa.
 Pyroelectric Instrument Co., 148 E. State St., Trenton, N. J.
—Enameling
 *BEST, INC., W. N., 11 Broadway, New York... *p. 411*
 KENWORTHY, INC., CHARLES F., Waterbury, Conn... *pp. 414, 415*
 ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
—Forging
 American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.
 American Shop Equipment Co., McCormick Bldg., Chicago, Ill.
 ANTHONY CO., 138 West Ave., Long Island City, N. Y... *p. 410*
 *BEST, INC., W. N., 11 Broadway, New York... *p. 411*
 Hadley, Frederick V., 50 Congress St., Boston, Mass.
 KENWORTHY, INC., CHARLES F., Waterbury, Conn... *pp. 414, 415*
 *LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York... *p. 93*
 Mires Fuel Oil Equipment Co., Lancaster, Pa.
 National Supply Co., 416 W. Grand Ave., Chicago, Ill.
 ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*

Fur

See Catalogue Section for data of firms listed in capital type

FURNACES (Continued)**—Forging**

TATE-JONES & CO., INC., Pittsburgh, Pa...
pp. 416, 417

—Gas

American Gas Furnace Co., 24 John St., New York

BROWN INSTRUMENT CO., Philadelphia, Pa... p. 531

Buffalo Dental Mfg. Co., 587-589 Main St., Buffalo, N. Y.

Chicago Flexible Shaft Co., 579 LaSalle Ave., Chicago, Ill.

Flinn & Drefflein Co., 431 S. Dearborn St., Chicago, Ill.

GWYNN ENGRG. CO., 100-108 Liberty Ave., Pittsburgh, Pa... p. 412

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... p. 494

Kroeschell Bros., 460 West Erie St., Chicago, Ill... p. 56

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... p. 496

National Gas Furnace Co., 9 Coddling St., Providence, R. I.

NELSON BLOWER & FURNACE CO., 11 Elkins St., Boston, Mass... p. 67

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

Schwab, Gustav, 525 Market St., San Francisco, Cal.

Standard Fuel Appliance Co., 1269 Beaufait Ave., Detroit, Mich.

Strong, Carlisle & Hammond Co., Cleveland, O.

Surface Combustion Co., 366-368 Gerard Ave., New York

Syracuse Industrial Gas Co., 206 McCarthy Bldg., Syracuse, N. Y.

TATE-JONES & CO., INC., Pittsburgh, Pa...
pp. 416, 417

—Gun

Electric Furnace Co., Alliance, O.

TATE-JONES & CO., INC., Pittsburgh, Pa...
pp. 416, 417

—Hardening
American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.

ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

*BEST, INC., W. N., 11 Broadway, New York...
p. 411

BROWN INSTRUMENT CO., Philadelphia, Pa... p. 531

Metals Production Equipment Co., 105 W. 40th St., New York

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

Scott, C. U., Head of Wall St., Davenport, Ia.

Standard Fuel Appliance Co., 1269 Beaufait Ave., Detroit, Mich.

TATE-JONES & CO., INC., Pittsburgh, Pa...
pp. 416, 417

—Heat Treating
American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.

American Metallurgical Corp'n, Franklin Trust Bldg., Philadelphia, Pa.

American Shop Equipment Co., McCormick Bldg., Chicago, Ill.

ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

*BEST, INC., W. N., 11 Broadway, New York...
p. 411

BROWN INSTRUMENT CO., Philadelphia, Pa... p. 531

Eclipse Fuel Engrg. Co., Rockford, Ill.

Electric Furnace Co., Alliance, O.

Gilbert & Barker Mfg. Co., Springfield, Mass.

GWYNN ENGRG. CO., 100-108 Liberty Ave., Pittsburgh, Pa... p. 412

Hadley, Frederick V., 50 Congress St., Boston, Mass.

Hoskins Mfg. Co., 467 Lawton Ave., Detroit, Mich.

KENWORTHY, INC., CHARLES F., Waterbury, Conn... pp. 414, 415

*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York... p. 93

Moyer, Albert W., Singer Bldg., New York

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

Standard Fuel Appliance Co., 1269 Beaufait Ave., Detroit, Mich.

Strong, Carlisle & Hammond Co., Cleveland, O.

Surface Combustion Co., 366-368 Gerard Ave., New York

TATE-JONES & CO., INC., Pittsburgh, Pa...
pp. 416, 417

—Japanning
KENWORTHY, INC., CHARLES F., Waterbury, Conn... pp. 414, 415

—Laboratory
*BEST, INC., W. N., 11 Broadway, New York...
p. 411

BROWN INSTRUMENT CO., Philadelphia, Pa... p. 531

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

—Melting
ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

*BEST, INC., W. N., 11 Broadway, New York...
p. 411

Crowley Co., John A., 120 Liberty St., New York

Eclipse Fuel Engrg. Co., Rockford, Ill.

Electric Furnace Co., Alliance, O.

Foundry Equipment Co., 1831 Columbus Road, Cleveland, O.

Granger Co., A. D. (Schwartz), 15 Park Row, New York

Greene Process Metal Co., 1602 Hoge Bldg., Seattle, Wash.

Hadley, Frederick V., 50 Congress St., Boston, Mass.

Hawley Down-Draft Furnace Co., Easton, Pa.

Industrial Electric Furnace Co., 1405 Monnock Bldg., Chicago, Ill.

KENWORTHY, INC., CHARLES F., Waterbury, Conn... pp. 414, 415

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... p. 494

*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York... p. 93

Monarch Engineering & Mfg. Co., Baltimore, Md.

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... p. 272

—Muffle
American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.

ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

*BEST, INC., W. N., 11 Broadway, New York...
p. 411

Didier-March Co., P. O. Box 327, Perth Amboy, N. J.

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

—Non-Oxidizing
American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.

ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

*BEST, INC., W. N., 11 Broadway, New York...
p. 411

KENWORTHY, INC., CHARLES F., Waterbury, Conn... pp. 414, 415

ROCKWELL CO., W. S., 50 Church St., New York... p. 413

—Oil
ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

*BEST, INC., W. N., 11 Broadway, New York...
p. 411

Burns Hydro Carbon Burner Co., Fort Plain, N. Y.

Chicago Flexible Shaft Co., 579 LaSalle Ave., Chicago, Ill.

Fur

Hadley, Frederick V., 50 Congress St., Boston, Mass.
KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill... *p. 56*
National Supply Co., 416 W. Grand Ave., Chicago, Ill.
 Naudain, John E., Sparrows Point, Md.
Production Engineering Co., 1716 Spring Garden St., Philadelphia, Pa.
ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
Standard Fuel Appliance Co., 1269 Beaufait Ave., Detroit, Mich.
 Strong, Carlisle & Hammond Co., Cleveland, O.
Syracuse Industrial Gas Co. (Syracuse), 206 McCarthy Bldg., Syracuse, N. Y.
TATE-JONES & CO., INC., Pittsburgh, Pa... *pp. 416, 417*
 —**Open Hearth**
WELLMAN-SEAEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*
 —**Plate Heating**
 Hadley, Frederick V., 50 Congress St., Boston, Mass.
 —**Powdered Fuel**
***QUIGLEY FURNACE SPECIALTIES CO.**, 26 Cortlandt St., New York... *pp. 94, 100*
STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*
 —**Producer Gas**
STEERE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... *p. 503*
 —**Projectile**
TATE-JONES & CO., INC., Pittsburgh, Pa... *pp. 416, 417*
 —**Refining**
Industrial Electric Furnace Co., 1405 Monadnock Bldg., Chicago, Ill.
ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
 —**Reheating**
American Incandescent Heat Co., Inc., 10 Post Office Sq., Boston, Mass.
***BEST, INC.**, W. N., 11 Broadway, New York... *p. 411*
***LOCOMOTIVE PULVERIZED FUEL CO.**, 30 Church St., New York... *p. 93*
ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
WELLMAN-SEAEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*
 —**Rivet**
ANTHONY CO., 138 West Ave., Long Island City, N. Y... *p. 410*
***BEST, INC.**, W. N., 11 Broadway, New York... *p. 411*
 Beach-Russ Co., 220 Broadway, New York
 Hadley, Frederick V., 50 Congress St., Boston, Mass.
Monarch Engineering & Mfg. Co., Baltimore, Md.
 —**Scaling**
 Hadley, Frederick V., 50 Congress St., Boston, Mass.
ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*
 —**Sherardizing**
United States Sherardizing Co., New Castle, Pa.
 —**Smokeless**
AUTOMATIC FURNACE CO., Dayton, O... *p. 78*
***BEST, INC.**, W. N., 11 Broadway, New York... *p. 411*
 Burke Furnace Co., Chicago, Ill.
***CASEY-HEDGES CO.**, Chattanooga, Tenn... *pp. 42, 43*
CHICAGO TILE ARCH FURNACE CO., 1160 Monadnock Block, Chicago, Ill... *p. 96*
 Crowe, Paul L., 33 Bidwell Ave., Jersey City, N. J.
DETROIT STOKER CO., Detroit, Mich... *p. 79*

FLYNN & EMRICH CO., Baltimore, Md... *p. 85*
***GREEN ENGINEERING CO.**, 13 Kennedy Ave., East Chicago, Ind... *pp. 80, 81*
 Herbert Boiler Co., Root & LaSalle Sts., Chicago, Ill.
 Hoff Co., M. A., Indianapolis, Ind.
 Illinois Stoker Co., Alton, Ill.
 Laclede-Christy Clay Products Co., 1673 Ry. Exchange Bldg., St. Louis, Mo.
***LOCOMOTIVE PULVERIZED FUEL CO.**, 30 Church St., New York... *p. 93*
 McKenzie Furnace Co., 647 McCormick Bldg., Chicago, Ill.
 McMillan & Co., James, 114 Clarkson Court, Chicago, Ill.
***MURPHY IRON WORKS**, Detroit, Mich... *pp. 82, 83*
 Scharf Smoke Preventer Co., Ypsilanti, Mich.
ST. JOHN GRATE BAR CO., Machinery Dept., The Bourse, Philadelphia, Pa... *p. 90*
STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*
 Swift Stoker Co., Railway Exchange Bldg., Chicago, Ill.
 Twin Fire Furnace Co., 1252 First National Bank Bldg., Chicago, Ill.
UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*
WASHBURN & GRANGER, 50 Church St., New York... *p. 91*
 —**Steel**
 Greene Process Metal Co., 1602 Hoge Bldg., Seattle, Wash.
 Industrial Electric Furnace Co., 1405 Monadnock Bldg., Chicago, Ill.
 Pittsburgh Furnace Co., 707 Union Bank Bldg., Pittsburgh, Pa.
 Scott, C. U., Head of Wall St., Davenport, Ia.
 U. S. Electric Furnace Co., 704 Union Bank Bldg., Pittsburgh, Pa.
 —**Wire Annealing**
 Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
FUSES
 D & W FUSE CO., Providence, R. I... *p. 393*
***GENERAL ELECTRIC CO.**, Schenectady, N. Y... *pp. 20, 21, 521*
***JOHNS-MANVILLE CO.**, H. W., 296 Madison Ave., New York... *p. 162*
 Johns-Pratt Co. (Noark), 555 Capitol Ave., Hartford, Conn.
 Roybel Packing Co., 30 Church St., New York
***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa... *pp. 114, 115*
FUSIBLE PLUGS
 (See Plugs, Fusible)

G

GAGE BOARDS
AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*
 Ashcroft Mfg. Co., 119 W. 40th St., New York
***ASHTON VALVE CO.**, 161 First St., Cambridge, Boston, Mass... *p. 526*
 Bogardus-Nelson Co., Marshalltown, Iowa
CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*
***FOXBORO CO., INC.**, Foxboro, Mass... *p. 533*
 LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... *pp. 127, 528*
***PRECISION INSTRUMENT CO.**, Detroit, Mich... *p. 524*
***SCHAEFFER & BUDENBERG MFG. CO.**, Brooklyn, N. Y... *pp. 534*
UNITED STATES GAUGE CO., 67 Wall St., New York... *p. 529*
WEBSTER & CO., WARREN, Camden, N. J... *pp. 108, 109, 110*
GAGE GLASS PROTECTORS
 Boston Steam Specialty Co., 185 Franklin St., Boston, Mass.

GAGE GLASS PROTECTORS (Continued)

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... pp. 120, 121, 122, 123

Sargent Co., 625 W. Jackson Blvd., Chicago, Ill.

GAGE GLASSES

Advance Packing & Supply Co. (Firma), 11 N. Franklin St., Chicago, Ill.

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... p. 526

Chesterston Co., A. W., 64 India St., Boston, Mass.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... pp. 120, 121, 122, 123

Durabla Mfg. Co., 114 Liberty St., New York

Magee Valve Co., Inc., 136 Beekman St., New York

GAGE TESTERS

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... pp. 142, 143

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... p. 526

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... p. 527

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... pp. 127, 528

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... pp. 534

Sterling Products Co., Inc., Harvard Sq., Cambridge, Mass.

UNITED STATES GAUGE CO., 67 Wall St., New York... p. 529

GAGES**—Absolute Pressure**

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... pp. 142, 143

BROWN INSTRUMENT CO., Philadelphia, Pa... p. 531

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... p. 527

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... pp. 127, 528

*PRECISION INSTRUMENT CO., Detroit, Mich... p. 524

TAGLIABUE MFG. CO., C. J., 18 88 33rd St., Brooklyn, N. Y... p. 535

TAYLOR INSTRUMENT COS., Rochester, N. Y... p. 536

UEHLING INSTRUMENT CO., 2011 Empire Bldg., New York... p. 525

UNITED STATES GAUGE CO., 67 Wall St., New York... p. 529

—Altitude

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... pp. 142, 143

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... p. 526

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... p. 527

*FOXBORO CO., INC., Foxboro, Mass... p. 533

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... pp. 127, 528

*PRECISION INSTRUMENT CO., Detroit, Mich... p. 524

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... pp. 534

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... p. 535

UNITED STATES GAUGE CO., 67 Wall St., New York... p. 529

—Ammonia

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... pp. 142, 143

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... p. 526

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... p. 527

*FOXBORO CO., INC., Foxboro, Mass... p. 533

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... pp. 127, 528

*PRECISION INSTRUMENT CO., Detroit, Mich... p. 524

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... p. 534

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... p. 535

UNITED STATES GAUGE CO., 67 Wall St., New York... p. 529

—Caliper

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... p. 397

—Differential Pressure

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... p. 526

Bacharach Industrial Instrument Co., 422 First Ave., Pittsburgh, Pa.

*BAILEY METER CO., 141 Milk St., Boston, Mass... p. 519

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... p. 527

*FOXBORO CO., INC., Foxboro, Mass... p. 533

*PRECISION INSTRUMENT CO., Detroit, Mich... p. 524

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... p. 534

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... p. 535

—Draft

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... pp. 142, 143

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... p. 526

Bacharach Industrial Instrument Co., 422 First Ave., Pittsburgh, Pa.

*BAILEY METER CO., 141 Milk St., Boston, Mass... p. 519

BRISTOL CO., Waterbury, Conn... p. 530

BROWN INSTRUMENT CO., Philadelphia, Pa... p. 531

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... p. 527

Defender Automatic Regulator Co., 506 Oriel Bldg., St. Louis, Mo.

Dwight Mfg. Co., 14 S. Jefferson St., Chicago, Ill.

Ellison, Lewis M., 214 W. Kinzie St., Chicago, Ill.

*FOXBORO CO., INC., Foxboro, Mass... p. 533

Frink Pyrometer Co., Lancaster, Ohio

HAMMEL OIL BURNING EQUIPMENT CO., 409 Pine St., Providence, R. I... p. 95

HAYS CORP'N, JOS. W., Michigan City, Ind... p. 523

*PRECISION INSTRUMENT CO., Detroit, Mich... p. 524

Sargent Steam Meter Co., 800-802 Sibley St., Chicago, Ill.

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... p. 534

TAGLIABUE MFG. CO., C. J., 18-88 Thirty-third St., Brooklyn, N. Y... p. 535

TAYLOR INSTRUMENT CO., Rochester, N. Y... p. 536

UEHLING INSTRUMENT CO., 2011 Empire Bldg., New York... p. 525

—Gun

Holmes Mfg. Co., Shelton, Conn.

—Hydraulic

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... pp. 142, 143

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... p. 526

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... p. 527

*FOXBORO CO., INC., Foxboro, Mass... p. 533

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... pp. 127, 528

National Gauge & Equipment Co., La Crosse, Wis.

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... pp. 534

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... p. 535

Gag

UNITED STATES GAUGE CO., 67 Wall St.,
New York... *p. 520*
WATSON-STILLMAN CO., 35 Church St.,
New York... *p. 457*

—**Measuring (Surface, Depth, Dial, etc.)**

Bicknell-Thomas Co., Greenfield, Mass.
CLEVELAND TWIST DRILL CO., Cleveland,
O... *p. 378*

Coats Machine Tool Co., Inc. (Prestwich), 30
Church St., New York

Dodge Tool Co., Grinnell, Ia.

Elgin Tool Works, Elgin, Ill.

*GREENFIELD TAP & DIE CORP'N, Green-
field, Mass... *pp. 374, 375*

Hartford Special Machinery Co., Hartford,
Conn.

MEHL MACHINE TOOL & DIE CO., Roselle,
N. J... *pp. 376, 377*

Meyers Co., W. F., Bedford, Ind.

Nestor Mfg. Co., 40 W. 13th St., New York

PRATT & WHITNEY CO., 111 Broadway,
New York... *p. 344*

*PRECISION INSTRUMENT CO., Detroit,
Mich... *p. 524*

Robbins, Gamwell & Co., Pittsfield, Mass.

Rogers Works, Inc., John M., Gloucester City,
N. J.

SLOCUM, AVRAM & SLOCUM LABORA-
TORIES, INC., 531-537 W. 21st St., New
York... *p. 538*

Starrett Co., L. S., Athol, Mass.

Swedish Gauge Co., Inc., 245 W. 55th St., New
York

Taft-Peirce Mfg. Co., Woonsocket, R. I.

Winchester Repeating Arms Co., New Haven,
Conn.

—**Oxy-Acetylene**

AMERICAN STEAM GAUGE & VALVE MFG.
CO., Boston, Mass... *pp. 142, 143*

*ASHTON VALVE CO., 161 First St., Cam-
bridge, Boston, Mass... *p. 526*

National Gauge & Equipment Co., LaCrosse,
Wis.

OXWELD ACETYLENE CO., 646-686 Preling-
huysen Ave., Newark, N. J... *p. 421*

*SCHAEFFER & BUDENBERG MFG. CO.,
Brooklyn, N. Y... *p. 534*

—**Pressure**

*AMERICAN DISTRICT STEAM CO., North
Tonawanda, N. Y... *p. 140*

AMERICAN STEAM GAUGE & VALVE MFG.
CO., Boston, Mass... *pp. 142, 143*

Ashcroft Mfg. Co., 119 W. 40th St., New York

*ASHTON VALVE CO., 161 First St., Cam-
bridge, Boston, Mass... *p. 526*

Bacharach Industrial Instrument Co., 422 First
Ave., Pittsburgh, Pa.

Bogardus-Nelson Co., Marshalltown, Iowa

BRISTOL CO., Waterbury, Conn... *p. 530*

BROWN INSTRUMENT CO., Philadelphia,
Pa... *p. 531*

CROSBY STEAM GAGE & VALVE CO.,
40 Central St., Boston, Mass... *p. 527*

*FOXBORO CO., INC., Foxboro, Mass... *p. 533*

Jones Gauge Co., 51½ Broad St., Boston, Mass.

LONERGAN CO., J. E., 211-215 Race St.,
Philadelphia, Pa... *pp. 127, 528*

Marsh & Co., James P., 118 S. Clinton St.,
Chicago, Ill.

Meriam Co., 8405 Detroit Ave., Cleveland, O.

National Gauge & Equipment Co., La Crosse,
Wis.

National Gauge Co., 300 Pacific St., Brooklyn,
N. Y.

National Steam Specialty Co., 12 S. Clinton
St., Chicago, Ill.

Pittsburgh Gauge & Supply Co., Pittsburgh, Pa.

*PRECISION INSTRUMENT CO., Detroit,
Mich... *p. 524*

*SCHAEFFER & BUDENBERG MFG. CO.,
Brooklyn, N. Y... *p. 534*

Star Brass Mfg. Co., 108 E. Dedham St., Boston,
Mass.

TAGLIABUE MFG. CO., C. J., 18-88 33rd
St., Brooklyn, N. Y... *p. 535*

UNITED STATES GAUGE CO., 67 Wall St.,
New York... *p. 520*

WEBSTER & CO., WARREN, Camden, N.
J... *pp. 108, 109, 110*

—**Plug and Ring**

Meyers Co., W. F., Bedford, Ind.

—**Rate of Flow**

Bacharach Industrial Instrument Co., 422 First
Ave., Pittsburgh, Pa.

BROWN INSTRUMENT CO., Philadelphia,
Pa... *p. 531*

*FOXBORO CO., INC., Foxboro, Mass...
p. 535

*GENERAL ELECTRIC CO., Schenectady,
N. Y... *pp. 20, 21, 521*

*PRECISION INSTRUMENT CO., Detroit,
Mich... *p. 524*

—**Rubber Measuring**

HOGGSON & PETTIS MFG. CO., New Haven,
Conn... *pp. 394, 395, 396*

—**Screw Thread**

Goddard Tool Co., 351 W. Chicago Ave., Chicago,
Ill.

*GREENFIELD TAP & DIE CORP'N, Green-
field, Mass... *pp. 374, 375*

Illinois Tool Works, 154-166 E. Erie St., Chicago,
Ill.

Meyers Co., W. F., Bedford, Ind.

—**Vacuum**

AMERICAN STEAM GAUGE & VALVE MFG.
CO., Boston, Mass... *pp. 142, 143*

*ASHTON VALVE CO., 161 First St., Cam-
bridge, Boston, Mass... *p. 526*

Bogardus-Nelson Co., Marshalltown, Iowa

BRISTOL CO., Waterbury, Conn... *p. 530*

BROWN INSTRUMENT CO., Philadelphia,
Pa... *p. 531*

CROSBY STEAM GAGE & VALVE CO.,
40 Central St., Boston, Mass... *p. 527*

*FOXBORO CO., INC., Foxboro, Mass... *p. 533*

Jones Gauge Co., 51½ Broad St., Boston, Mass.

LONERGAN CO., J. E., 211-215 Race St.,
Philadelphia, Pa... *pp. 127, 528*

National Gauge Co., 300 Pacific St., Brooklyn,
N. Y.

*PRECISION INSTRUMENT CO., Detroit,
Mich... *p. 524*

TAGLIABUE MFG. CO., C. J., 18-88 33rd St.,
Brooklyn, N. Y... *p. 535*

TAYLOR INSTRUMENT COS., Rochester,
N. Y... *p. 536*

UNITED STATES GAUGE CO., 67 Wall St.,
New York... *p. 520*

WEBSTER & CO., WARREN, Camden, N.
J... *pp. 108, 109, 110*

—**Volume**

Bacharach Industrial Instrument Co., 422 First
Ave., Pittsburgh, Pa.

BROWN INSTRUMENT CO., Philadelphia,
Pa... *p. 531*

*FOXBORO CO., INC., Foxboro, Mass... *p. 533*

*PRECISION INSTRUMENT CO., Detroit,
Mich... *p. 524*

—**Water**

*AMERICAN DISTRICT STEAM CO., North
Tonawanda, N. Y... *p. 140*

AMERICAN STEAM GAUGE & VALVE MFG.
CO., Boston, Mass... *pp. 142, 143*

*ASHTON VALVE CO., 161 First St., Cam-
bridge, Boston, Mass... *p. 526*

BRISTOL CO., Waterbury, Conn... *p. 530*

BROWN INSTRUMENT CO., Philadelphia,
Pa... *p. 531*

BUCKEYE IRON & BRASS WORKS, Dayton,
O... *p. 481*

CROSBY STEAM GAGE & VALVE CO.,
40 Central St., Boston, Mass... *p. 527*

Davis Instrument Mfg. Co., Inc., 110 W. Fayette
St., Baltimore, Md.

DETROIT LUBRICATOR CO., Detroit, Mich.
... *p. 167*

Gag

GAGES (Continued)**—Water**

***FOXBORO CO., INC.**, Foxboro, Mass... *p. 533*

Huyette Co., Paul B. (P. B. H.), 18th & Market Sts., Philadelphia, Pa.

***JENKINS BROS.**, 80 White St., New York... *pp. 128, 129*

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... *pp. 127, 528*

McRae & Roberts Co., Detroit, Mich.

Ohio Brass Co., Mansfield, O.

PENBERTHY INJECTOR CO., Detroit, Mich... *pp. 152, 153*

***PRECISION INSTRUMENT CO.**, Detroit, Mich... *p. 524*

Rich Mfg. Co., 370 Atlantic Ave., Boston, Mass.

Sargent Co., 625 W. Jackson Blvd., Chicago, Ill.

Steigert Co., L. N. E. Cor. Elder & Sogan Sts., Cincinnati, O.

Watertown Specialty Co., 124 E. Moulton St., Watertown, N. Y.

Williams Gauge Co., 543 Fourth Ave., Pittsburgh, Pa.

—Water Level

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*

BRISTOL CO., Waterbury, Conn... *p. 530*

***FOXBORO CO., INC.**, Foxboro, Mass... *p. 533*

Hydro Mfg. Co., 320 Bullitt Bldg., Philadelphia, Pa.

***PRECISION INSTRUMENT CO.**, Detroit, Mich... *p. 524*

***SCHAEFFER & BUDENBERG MFG. CO.**, Brooklyn, N. Y... *p. 534*

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... *p. 535*

GALVANIZING

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 494*

MALLEABLE IRON FITTINGS CO., Branford, Conn... *p. 157*

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... *p. 279*

VAN DORN & DUTTON CO., Cleveland, O... *p. 370*

WRIGHT WIRE CO., Worcester, Mass... *p. 282*

—Hot Process

Ruemmel-Dawley Mfg. Co., 3900 Chouteau Ave., St. Louis, Mo.

GALVANIZING EQUIPMENT

Meaker Galvanizing Co., 1243-1249 Fulton St., Chicago, Ill.

Schaeffer Machine Works, 35th & Grays Ferry Road, Philadelphia, Pa.

—Wire

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GALVANOMETERS

BROWN INSTRUMENT CO., Philadelphia, Pa... *p. 531*

***FOXBORO CO., INC.**, Foxboro, Mass... *p. 533*

***GENERAL ELECTRIC CO.**, Schenectady, N. Y... *pp. 20, 21, 521*

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

Thompson-Levering Co., 325 Arch St., Philadelphia, Pa.

***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa... *pp. 114, 115*

***WESTON ELECTRICAL INSTRUMENT CO.**, 149 Weston Ave., Waverly Park, Newark, N. J... *p. 537*

GARBAGE BURNERS

(See Destructors, Refuse)

GAS ANALYSIS APPARATUS

Defender Automatic Regulator Co., 506 Oriol Bldg., St. Louis, Mo.

Duemler, G. Frank, 837 Sanger St., Philadelphia, Pa.

Dwight Mfg. Co., 14 S. Jefferson St., Chicago, Ill.

Rimer & Amend, 205 3rd Ave., New York

***FOXBORO CO., INC.**, Foxboro, Mass... *p. 533*

Harger Co., F. D., 325 Ellicott Square, Buffalo, N. Y.

HAYS CORP'N, JOSEPH W., Michigan City, Ind... *p. 523*

Huyette Co., Paul B. (P. B. H.), 18th & Market Sts., Philadelphia, Pa.

Pierce Co., Wm. B., 45 North Division St., Buffalo, N. Y.

***PRECISION INSTRUMENT CO.**, Detroit, Mich... *p. 524*

GAS APPARATUS, FUEL

Kemp Mfg. Co., C. M., Baltimore, Md.

Selas Co., 521 W. 23rd St., New York

GAS BURNERS, COMPRESSORS, ENGINES, EXHAUSTERS, PRODUCERS, ETC.

(See Burners, Compressors, Engines, Exhausters, Producers, etc., Gas)

GAS BURNING EQUIPMENT

GWYNN ENGRG. CO., 100-108 Liberty Ave., Pittsburgh, Pa... *p. 412*

Kemp Mfg. Co., C. M., Baltimore, Md.

Oven Equipment & Mfg. Co., New Haven, Conn.

ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*

Selas Co., 521 W. 23rd St., New York

GAS CLEANING PLANTS

Coal & Coke By-Products Co., 421 Wood St., Pittsburgh, Pa.

Flinn & Dreffeln Co., 431 S. Dearborn St., Chicago, Ill.

STEERE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... *p. 503*

GAS COLLECTORS

***PRECISION INSTRUMENT CO.**, Detroit, Mich... *p. 524*

GAS DETECTORS (Mine)

Quimby Engineering Co., 915 Ridge Ave., Philadelphia, Pa.

GAS PLANT MACHINERY

Bartlett Hayward Co., Baltimore, Md.

Coal & Coke By-Products Co., 421 Wood St., Pittsburgh, Pa.

COLE MFG. CO., R. D., Newnan, Ga... *p. 41*

Isbell-Porter Co., 46 Bridge St., Newark, N. J.

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

STEERE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... *p. 503*

Western Gas Construction Co., Fort Wayne, Ind.

—Producer

COLE MFG. CO., R. D., Newnan, Ga... *p. 41*

MILWAUKEE RELIANCE BOILER WORKS., Milwaukee, Wis... *p. 112*

STEERE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... *p. 503*

***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa... *pp. 114, 115*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

GAS PLANTS**—Acetylene Lighting**

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J... *p. 421*

—Acetylene Welding

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J... *p. 421*

—Blue

STEERE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... *p. 503*

United Gas Improvement Co., Broad & Arch Sts., Philadelphia, Pa.

WOOD & CO., Philadelphia, Pa... *p. 458*

—Coal

Gas Machinery Co., 1900 Euclid Ave., Cleveland, O.

Riter-Conley Co., Pittsburgh, Pa.

STEERE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... *p. 503*

Gag

United Gas Improvement Co., Broad & Arch
Sts., Philadelphia, Pa.
WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

—Gasoline

Detroit Heating & Lighting Co., Lieb & Wight
Sts., Detroit, Mich

—Oil

STEEER ENGINEERING CO., Woodward &
Horton Ave., Detroit, Mich... *p. 503*

—Oxygen and Hydrogen

Burdett Mfg. Co., 309 St. Johns Court, Chicago,
Ill.

—Producer

Akerlund & Semmes, 17 Battery Place, New York
Amser Gas Power Co., Wabash Bldg., Pitts-
burgh, Pa.

Chapman Engineering Co., 11 Broadway, New
York

Duff Patents Co., Inc., 918 Frick Bldg., Pitts-
burgh, Pa

Flinn & Dreffein Co., 431 S. Dearborn St.,
Chicago, Ill.

MILWAUKEE RELIANCE BOILER WORKS,
Milwaukee, Wis... *p. 112*

NELSON BLOWER & FURNACE CO., 11
Elkins St., Boston, Mass... *p. 67*

STEEER ENGINEERING CO., Woodward &
Horton Ave., Detroit, Mich... *p. 503*

WELLMAN-SEAWER-MORGAN CO., 7000
Central Ave., Cleveland, O... *p. 272*

*WESTINGHOUSE ELECTRIC & MFG. CO.,
East Pittsburgh, Pa... *pp. 114, 115*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

—Water, Carburetted

ANTHONY CO., 138 West Ave., Long Island
City, N. Y... *p. 410*

Gas Machinery Co., 1900 Euclid Ave., Cleve-
land, O.

STEEER ENGINEERING CO., Woodward &
Horton Ave., Detroit, Mich... *p. 503*

United Gas Improvement Co., Broad & Arch
Sts., Philadelphia, Pa.

GAS PURIFYING MATERIALS

Connelly Iron Sponge & Governor Co. (Siphon),
227 Fulton St., New York

GAS WASHERS

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

GAS WELL SUPPLIES

National Supply Co., 136 Huron St., Toledo, O.

GASKETS

—Ammonia

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp. 120, 121, 122, 123*

Flexitallic Gasket Co. (Flexitallic), P. O. Box
143, Camden, N. J.

*GREENE, TWEED & CO., 109 Duane St.,
New York... *p. 168*

Guillott Metal Gasket & Supply Co., 24 S. Clinton
St., Chicago, Ill.

McCord MFG. CO., Detroit, Mich... *p. 169*

—Asbestos

Burgman Asbestos & Packing Mills, Feodor,
28 Cortlandt St., New York

Cincinnati Gasket & Packing Co., 1546-48
Elm St., Cincinnati, O.

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp. 120, 121, 122, 123*

Dominion Asbestos & Rubber Corp'n, 154 Nassau
St., New York

GOODRICH RUBBER CO., B. F., Akron, O...
pp. 183, 242

McCord MFG. CO., Detroit, Mich... *p. 169*

New Jersey Asbestos Co., Camden, N. J.

Standard Mfg. & Supply Co., 30 N. 4th St.,
Philadelphia, Pa.

Victor Mfg. & Gasket Co., Troy & 21st Sts.,
Chicago, Ill.

—Boiler

Dominion Asbestos & Rubber Corp'n, 154 Nassau
St., New York

Guillott Metal Gasket & Supply Co., 24 S. Clinton
St., Chicago, Ill.

—Copper, Corrugated

AKRON METALLIC GASKET CO., 152 N.
Union St., Akron, O... *p. 177*

Cincinnati Gasket & Packing Co., 1546-48 Elm
St., Cincinnati, O.

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp. 120, 121, 122, 123*

*GOETZE GASKET & PACKING CO., 22
Allen Ave., New Brunswick, N. J... *p. 180*

Guillott Metal Gasket & Supply Co., 24 S.
Clinton St., Chicago, Ill.

McCord MFG. CO., Detroit, Mich... *p. 169*

Standard Mfg. & Supply Co., 30 N. 4th St.,
Philadelphia, Pa.

United States Mineral Wool Co., 280 Madison
Ave., New York

Victor Mfg. & Gasket Co., Troy & 21st Sts.,
Chicago, Ill.

—Fibre

AMERICAN VULCANIZED FIBRE CO.,
Wilmington, Del... *p. 296*

*DIAMOND STATE FIBRE CO., Bridgeport,
Pa... *p. 298*

Durabla Mfg. Co., 114 Liberty St., New York

Endura Mfg. Co., 63rd & Eastwick Ave., Phila-
delphia, Pa.

Fibre Finishing Co. (Vellumoid), 27 State St.,
Boston, Mass.

McCord MFG. CO., Detroit, Mich... *p. 169*

Vincent-Gilson Engineering Co., 30 Church St.,
New York

—Iron, Corrugated

Smooth-On Mfg. Co., 570-574 Communipaw
Ave., Jersey City, N. J.

—Lead

Guillott Metal Gasket & Supply Co., 24 S. Clinton
St., Chicago, Ill.

McCord MFG. CO., Detroit, Mich... *p. 169*

UNITED LEAD CO., 111 Broadway, New York
... *p. 299*

—Leather

GRATON & KNIGHT MFG. CO., Worcester,
Mass... *p. 237*

MARK MFG. CO., P. O. Box G, Chicago, Ill.
... *p. 160*

—Metal and Combination

AKRON METALLIC GASKET CO., 152 N.
Union Street, Akron, O... *p. 177*

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp. 120, 121, 122, 123*

Flexitallic Gasket Co. (Flexitallic), P. O. Box
143, Camden, N. J.

*GOETZE GASKET & PACKING CO., 22
Allen Ave., New Brunswick, N. J... *p. 180*

Guillott Metal Gasket & Supply Co., 24 S.
Clinton St., Chicago, Ill.

McCord MFG. CO., Detroit, Mich... *p. 169*

*SARCO CO., INC., Woolworth Bldg., New
York... *pp. 148, 149*

UNITED LEAD CO., 111 Broadway, New York.
... *p. 299*

U. S. Indestructible Gasket Co., 50 Church St.,
New York

—Rubber

Anchor Packing Co., 7th & Filbert Sts., Phila-
delphia, Pa.

Cincinnati Gasket & Packing Co., 1546-48
Elm St., Cincinnati, O.

Flexitallic Gasket Co. (Flexitallic), P. O. Box
143, Camden, N. J.

Gasket Supply Co., 1708 Ludlow St., Phila-
delphia, Pa.

GOODRICH RUBBER CO., B. F., Akron, O...
pp. 183, 242

*JENKINS BROS., 80 White St., New York...
pp. 128, 129

Walsh Packing Co., 304 New St., Philadelphia,
Pa.

Wilcox Mfg. Co., E. A., Chicago, Ill.

GASOLINE

Penn Oil & Supply Co., Oil City, Pa.

Standard Oil Co., Chicago, Ill.

*THE TEXAS COMPANY, 17 Battery Place,
New York... *p. 175*

Gas

GASOLINE (Continued)

TIDE WATER OIL CO. (Tydol), 11 Broadway,
New York... *p. 170*

GASOLINE PLANTS (Absorption and Compression)

HOPE ENGINEERING & SUPPLY CO.,
Mt. Vernon, O... *p. 32*

GASOLINE STORAGE OUTFITS

American Oil Pump & Tank Co., Findley &
Dalton Sts., Cincinnati, O.

KOVEN & BROTHER, L. O., 154 Ogden Ave.,
Jersey City, N. J... *p. 494*

Kupferle Bros. Mfg. Co., 600 N. Second St.,
St. Louis, Mo.

MILWAUKEE RELIANCE BOILER WORKS,
Milwaukee, Wis... *p. 112*

***SCAIFE & SONS CO.**, WM. B., Pittsburgh,
Pa... *pp. 103, 498*

GASOLINE TANK EQUIPMENT

KOVEN & BROTHER, L. O., 154 Ogden Ave.,
Jersey City, N. J... *p. 494*

GATE HOISTS

(See Hoists, Head Gate)

GATES**—Blast**

***PITTSBURGH VALVE FOUNDRY &
CONST. CO.**, Pittsburgh, Pa... *pp. 132, 133*
ROCKWELL CO., W. S., 50 Church St., New
York... *p. 413*

STERLING BLOWER CO., Hartford, Conn...
p. 436

STURTEVANT CO., B. F., Hyde Park, Boston,
Mass... *pp. 74, 75*

—Cut-Off

BARTLETT & SNOW CO., C. O., Cleveland,
O... *p. 249*

***HUNT CO. INC.**, C. W., West New Brighton,
Staten Island, N. Y... *pp. 252, 253*

***LINK-BELT CO.**, 39th St. & Stewart Ave.,
Chicago, Ill... *p. 256*

—Head

Coldwell-Wilcox Co., Newburgh, N. Y.

***HUNT MACHINE CO.**, RODNEY, Orange,
Mass... *p. 449*

Jolly, Inc., J. & W., Holyoke, Mass.

—Shear

Coldwell-Wilcox Co., Newburgh, N. Y.

—Sluice

Chapman Valve Mfg. Co., Indian Orchard,
Mass.

Coffin Valve Co., Neponset, Mass.

Coldwell-Wilcox Co., Newburgh, N. Y.

Dominion Bridge Co., Ltd., Montreal, P. Q.,
Canada

***HUNT MACHINE CO.**, RODNEY, Orange,
Mass... *p. 449*

***PITTSBURGH VALVE FOUNDRY &
CONST. CO.**, Pittsburgh, Pa... *pp. 132, 133*
Rennselaer Valve Co., Troy, N. Y.

GEAR CLEANING AND GRINDING MACHINES

Gear Grinding Machine Co., Detroit, Mich.
Upton & Gilman Machine Co., 587 Middlesex
St., Lowell, Mass.

GEAR CUTTING MACHINES

Allen Machine Co., 1585 Columbus Rd., N. W.,
Cleveland, O.

Bickett Machine & Mfg. Co., Cincinnati, O.

***BILTON MACHINE TOOL CO.**, Bridgeport,
Conn... *p. 353*

Brown & Sharpe Mfg. Co., Promenade St.,
Providence, R. I.

Cincinnati Gear Cutting Machine Co., Elam St. &
Garrard Ave., Cincinnati, O.

DE LAVAL STEAM TURBINE CO., Trenton,
N. J... *p. 22*

***FELLOWS GEAR SHAPER CO.**, Springfield,
Vt... *p. 349*

Flather Mfg. Co., E. J., Nashua, N. H.

Gleason Works, 1030 University Ave., Rochester,
N. Y.

Gould & Eberhardt, Chancellor Ave., Irvington,
N. J.

HIMOFF MACHINE CO., 45-53 Mills St.,
Astoria, New York... *p. 350*

Newark Gear Cutting Machine Co., 65-75
Prospect St., Newark, N. J.

PRATT & WHITNEY CO., 111 Broadway,
New York... *p. 344*

Riverside Machine Co., Front & Penn Sts.,
Chester, Pa.

SLOAN & CHACE MFG. CO., LTD., Sixth
Ave., Cor. N. 13th St., Newark, N. J... *p. 387*

Walker, Charles H., 941-14th Ave., Detroit,
Mich.

Waltham Machine Works, Waltham, Mass.

Whiton Machine Co., D. E., New London, Conn.

GEAR GENERATORS

Bilgram Machine Works, 1235 Spring Garden
St., Philadelphia, Pa.

***FELLOWS GEAR SHAPER CO.**, Springfield,
Vt... *p. 349*

Gleason Works, 1030 University Ave., Rochester,
N. Y.

Lees-Bradner Co., 6210 Carnegie Ave., Cleveland,
O.

Newark Gear Cutting Machine Co., 65-75
Prospect St., Newark, N. J.

NILES-BEMENT-POND CO., 111 Broadway,
New York... *p. 344*

GEAR HOBBING MACHINES

Adams Co., Dubuque, Iowa

Barbar-Colman Co., Rockford, Ill.

***BILTON MACHINE TOOL CO.**, Bridgeport,
Conn... *p. 353*

Gould & Eberhardt, Chancellor Ave., Irvington,
N. J.

HIMOFF MACHINE CO., 45-53 Mills St.,
Astoria, New York... *p. 350*

Lees-Bradner Co., 6210 Carnegie Ave., Cleveland,
O.

Meisselbach-Catucci Mfg. Co., 24 Congress St.,
Newark, N. J.

Reynolds Machine Co., N. West St., Massillon,
O.

GEAR MOLDING MACHINES

FULTON IRON WORKS CO., St. Louis, Mo...
p. 24

GEAR SHAPERS

***FELLOWS GEAR SHAPER CO.**, Springfield,
Vt... *p. 349*

GEAR TOOTH BOUNDING MACHINES

Ingle Machine Co., Rochester, N. Y.

Walker, Charles H., 941 14th Ave., Detroit,
Mich.

GEARS**—Automobile**

Bausch Machine Tool Co., Springfield, Mass.

Carpenter-Tew Gear Co., 67 35th St., Brooklyn,
N. Y.

Cincinnati Gear Co., 1825 Reading Road, Cincinnati,
O.

Detroit Gear & Machine Co., 127-151 Franklin
St., Detroit, Mich.

***DIAMOND STATE FIBRE CO.**, Bridgeport,
Pa... *p. 298*

Frost Gear & Forge Co., Jackson, Mich.

Ganschow Co., Wm., Washington-Morgan St.,
Chicago, Ill.

HIMOFF MACHINE CO., 45-53 Mills St.,
Astoria, New York... *p. 350*

***JAMES MFG. CO.**, D. O., 1118-24 W. Monroe
St., Chicago, Ill... *pp. 192, 193*

New Process Gear Corp'n, Syracuse, N. Y.

Nilson-Miller Co., 1300 Hudson St., Hoboken,
N. J.

NUTTALL CO., R. D., Pittsburgh, Pa... *p. 195*

VAN DORN & DUTTON CO., Cleveland, O...
p. 370

—Bakelite

***WESTINGHOUSE ELECTRIC & MFG. CO.**,
East Pittsburgh, Pa... *pp. 114, 115*

Gas

—Cloth

*GENERAL ELECTRIC CO., Schenectady, N. Y. . . *pp. 20, 21, 521*
 *JAMES MFG. CO., D. O., 1118-24 W. Monroe St., Chicago, Ill. . . *pp. 192, 193*
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p. 194*
 Meisel Press Mfg. Co., 952 Dorchester Ave., Boston, Mass.
 NUTTALL CO., R. D., Pittsburgh, Pa. . . *p. 195*

—Cut

Akron Gear & Engineering Co., Cor. South & High Sts., Akron, O.
 Albaugh-Dover Co., 2100 Marshall Blvd., Chicago, Ill.
 Bilgram Machine Works, 1235 Spring Garden St., Philadelphia, Pa.
 *BROWN CO., A. & F., 79 Barclay St., New York. . . *p. 187*
 Brown & Sharpe Mfg. Co., Promenade St., Providence, R. I.
 CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky. . . *p. 201*
 *CALDWELL & SON CO., H. W., 17th & Western Ave., Chicago, Ill. . . *p. 250*
 Carpenter-Tew Gear Co., 67 35th St., Brooklyn, N. Y.
 *CHAIN BELT CO., 735 Park St., Milwaukee, Wis. . . *pp. 118, 119*
 Chicago Rawhide Mfg. Co., 1301 Elston St., Chicago, Ill.
 Christiana Machine Co., Christiana, Pa.
 Cincinnati Gear Co., 1825 Reading Road, Cincinnati, O.
 CINCINNATI SCREW CO., Twightwee, O., (Cincinnati Suburb). . . *p. 402*
 Crofoot Gear Works, Inc., 31 Ames St., Cambridge, Mass.
 Cross Gear & Engine Co., 800-806 Bellevue Ave., Detroit, Mich.
 Davis, Rodney, 626 Race St., Philadelphia, Pa.
 Earle Gear & Machine Co., Stenton & Wyoming Aves., Wayne Junction, Philadelphia, Pa.
 *FAWCUS MACHINE CO., Pittsburgh, Pa. . . *pp. 190, 191*
 Flather Mfg. Co., E. J., Nashua, N. H.
 Foote Bros. Gear & Machine Co., 213 N. Curtis St., Chicago, Ill.
 Gerdes Co., Inc., 30 Church St., New York
 Gleason Works, 1030 University Ave., Rochester, N. Y.
 Grant Gear Works, 151 Pearl St., Boston, Mass.
 Grant-Lees Gear Co., 2367 E. 69th St., Cleveland, O.
 Hamilton Gear & Machine Co., Van Horne St., Toronto, Canada
 *HILL CLUTCH CO., Cleveland, O. . . *p. 208*
 HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York. . . *p. 350*
 Hindley Gear Co., 1105 Frankford Ave., Philadelphia, Pa.
 Horsburgh & Scott Co., Cleveland, O.
 *JAMES MFG. CO., D. O., 1118-24 W. Monroe St., Chicago, Ill. . . *pp. 192, 193*
 JOHNSON MACHINE CO., CARLYLE, Manchester, Conn. . . *p. 209*
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p. 194*
 Jones & Sons Co., E. D., P. O. Box 1632, Pittsfield, Mass.
 Lebanon Gear & Machine Wks., 15th & Forge Sts., Lebanon, Pa.
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill. . . *p. 256*
 Lyall, J. & W., Passaic, N. J.
 Maag Gear Co., 158 Fernbrook St., Yonkers, N. Y.
 Medart Patten Pulley Co., St. Louis, Mo.
 Meisel Press Mfg. Co., 952 Dorchester Ave., Boston, Mass.
 Meisselbach-Catucci Mfg. Co., 24 Congress St., Newark, N. J.
 Michigan Gear & Engineering Co., Vernor Bldg., West Detroit, Mich.
 New Process Gear Corp'n, Syracuse, N. Y.

New York Gear Works, 56 Greenpoint Ave., Brooklyn, N. Y.

Nilson-Miller Co., 1300 Hudson St., Hoboken, N. J.
 NUTTALL CO., R. D., Pittsburgh, Pa. . . *p. 195*
 Philadelphia Gear Works, 1120-24 Vine St., Philadelphia, Pa.
 Plamondon Mfg. Co., A., 12 N. Clinton St., Chicago, Ill.
 *POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md. . . *pp. 196, 197*
 Pyott Co., North Ave. & Noble St., Chicago, Ill.
 Simonds Mfg. Co., Liberty Ave. & 25th St., Pittsburgh, Pa.
 Sommerfield Machine & Mfg. Co., 220 2nd Ave., Pittsburgh, Pa.
 Spacke Machine & Tool Co., Indianapolis, Ind.
 Stahl Gear & Machine Co., 1390 E. 40th St., Cleveland, O.
 Tool Steel Gear & Pinion Co., Station P, Cincinnati, O.
 Turley Gear & Machine Co., 1505 N. 1st St., St. Louis, Mo.
 Union Gear & Machine Co., 27 Purchase St., Boston, Mass.
 Union Iron Works, Bangor, Me.
 VAN DORN & DUTTON CO., Cleveland, O. . . *p. 370*
 WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill. . . *pp. 258, 259, 260*
 Woburn Gear Works, Woburn, Mass.
 Woodard Machine Co., Wooster, O.

—Fibre

AMERICAN VULCANIZED FIBRE CO., Wilmington, Del. . . *p. 296*
 CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky. . . *p. 201*
 *CONTINENTAL FIBRE CO., Newark, Del. . . *p. 297*
 Delaware Hard Fibre Co., Ltd., Wilmington, Del.
 *DIAMOND STATE FIBRE CO., Bridgeport, Pa. . . *p. 298*
 HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York. . . *p. 350*
 *JAMES MFG. CO., D. O., 1118-24 W. Monroe St., Chicago, Ill. . . *pp. 192, 193*
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p. 194*
 NUTTALL CO., R. D., Pittsburgh, Pa. . . *p. 195*
 VAN DORN & DUTTON CO., Cleveland, O. . . *p. 370*

—Herringbone

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . *p. 250*
 DE LAVAL STEAM TURBINE CO., Trenton, N. J. . . *p. 22*
 FALK CO., Milwaukee, Wis. . . *pp. 188, 189*
 *FAWCUS MACHINE CO., Pittsburgh, Pa. . . *pp. 190, 191*
 *JAMES MFG. CO., D. O., 1118-24 W. Monroe St., Chicago, Ill. . . *pp. 192, 193*
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p. 194*
 Maag Gear Co., 158 Fernbrook St., Yonkers, N. Y.
 NUTTALL CO., R. D., Pittsburgh, Pa. . . *p. 195*
 *POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md. . . *pp. 196, 197*
 Sauer Power Generating Co., 5115 Rosetta St., Pittsburgh, Pa.
 VAN DORN & DUTTON CO., Cleveland, O. . . *p. 370*
 Woodard Machine Co., Wooster, O.

—Molded

Bosworth Arch Mach. & Foundry Co., Anniston, Ala.
 *BROWN CO., A. & F., 79 Barclay St., New York. . . *p. 187*
 CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky. . . *p. 201*
 *CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . *p. 250*
 DODGE SALES & ENGINEERING CO.,

Gea

GEARS (Continued)**—Molded**

Mishawaka, Ind... *pp.* 202, 203, 204, 205, 206
 Ehrsam & Sons Mfg. Co., J. B., Enterprise, Kan.
 *FULLER-LEHIGH CO., Fullerton, Pa... *p.* 92
 *HILL CLUTCH CO., Cleveland, O... *p.* 208
 JONES FOUNDRY & MACHINE CO., W. A.,
 4401 W. 12th St., Chicago, Ill... *p.* 194
 *LINK-BELT CO., 39th St. & Stewart Ave.,
 Chicago, Ill... *p.* 256
 MARSHALL FOUNDRY CO., 1st Natl. Bank
 Bldg., Pittsburgh, Pa... *p.* 496
 National Gear Wheel Foundry, Walker & South
 Ave., N. S., Pittsburgh, Pa.
 Nilson-Miller Co., 1300 Hudson St., Hoboken,
 N. J.
 NUTTALL CO., R. D., Pittsburgh, Pa... *p.* 195
 *POOLE ENGINEERING & MACHINE CO.,
 Woodberry, Baltimore, Md... *pp.* 196, 197
 VAN DORN & DUTTON CO., Cleveland, O.
 ... *p.* 370
 WELLER MFG. CO., 1820-1856 N. Kostner
 Ave., Chicago, Ill... *pp.* 258, 259, 260

—Railway Motor

*GENERAL ELECTRIC CO., Schenectady,
 N. Y... *pp.* 20, 21, 521
 HIMOFF MACHINE CO., 45-53 Mills St.,
 Astoria, New York... *p.* 350
 NUTTALL CO., R. D., Pittsburgh, Pa... *p.*
 195
 Tool Steel Gear & Pinion Co., Station P, Cin-
 cinnati, O.
 VAN DORN & DUTTON CO., Cleveland, O.
 ... *p.* 370

—Rawhide

Albaugh-Dover Co., 2100 Marshall Blvd.,
 Chicago, Ill.
 CALDWELL CO., INC., W. E., 340 E. Brandeis
 St., Louisville, Ky... *p.* 201
 Grant Gear Works, 151 Pearl St., Boston, Mass.
 HIMOFF MACHINE CO., 45-53 Mills St.,
 Astoria, New York... *p.* 350
 *JAMES MFG. CO., D. O., 1118-24 W. Monroe
 St., Chicago, Ill... *pp.* 192, 193
 JONES FOUNDRY & MACHINE CO., W. A.,
 4401 W. 12th St., Chicago, Ill... *p.* 194
 New Process Gear Corp'n, Syracuse, N. Y.
 NUTTALL CO., R. D., Pittsburgh, Pa... *p.* 195
 VAN DORN & DUTTON CO., Cleveland, O.
 Western Rawhide & Belting Co., 7th Ave. &
 S. Pierce St., Milwaukee, Wis.
 Woburn Gear Works, Woburn, Mass.

—Reverse (Marine)

Evans Stamping & Plating Co. (Paragon),
 Cushman St., Taunton, Mass.
 *GENERAL ELECTRIC CO., Schenectady,
 N. Y... *pp.* 20, 21, 521
 HIMOFF MACHINE CO., 45-53 Mills St.,
 Astoria, New York... *p.* 350
 JOHNSON MACHINE CO., CARLYLE, Man-
 chester, Conn... *p.* 209
 Laclede-Christy Clay Products Co., 1673 Ry.
 Exchange Bldg., St. Louis, Mo.
 NUTTALL CO., R. D., Pittsburgh, Pa... *p.* 195
 Paragon Gear Works (Paragon), Taunton, Mass.
 *POOLE ENGINEERING & MACHINE CO.,
 Woodberry, Baltimore, Md... *pp.* 196, 197
 VAN DORN & DUTTON CO., Cleveland, O.
 ... *p.* 370

—Speed Reduction

*CALDWELL & SON CO., H. W., 17th St. &
 Western Ave., Chicago, Ill... *p.* 250
 DE LAVAL STEAM TURBINE CO., Trenton,
 N. J... *p.* 22
 DODGE SALES & ENGINEERING CO.,
 Mishawaka, Ind... *pp.* 202, 203, 204, 205, 206
 Eagan-Rogers Steel & Iron Co., Crum Lynne,
 Pa.
 *FAWCUS MACHINE CO., Pittsburgh, Pa.
 ... *pp.* 190, 191
 Foote Bros. Gear & Machine Co., 213 N. Curtis
 St., Chicago, Ill.
 *GENERAL ELECTRIC CO., Schenectady,
 N. Y... *pp.* 20, 21, 521

*GREEN FUEL ECONOMIZER CO., 90 West
 St., New York... *p.* 73

HIMOFF MACHINE CO., 45-53 Mills St.,
 Astoria, New York... *p.* 350

*JAMES MFG. CO., D. O., 1118-24 W. Monroe
 St., Chicago, Ill... *pp.* 192, 193

JOHNSON MACHINE CO., CARLYLE, Man-
 chester, Conn... *p.* 209

JONES FOUNDRY & MACHINE CO., W. A.,
 4401 W. 12th St., Chicago, Ill... *p.* 194

Kerr Turbine Co., Wellsville, N. Y.
 *LINK-BELT CO., 39th St. & Stewart Ave.,
 Chicago, Ill... *p.* 256

Meisel Press Mfg. Co., 952 Dorchester Ave.,
 Boston, Mass.

Moore Steam Turbine Corp'n, Wellsville, N. Y.
 NUTTALL CO., R. D., Pittsburgh, Pa... *p.*
 195

*POOLE ENGINEERING & MACHINE CO.,
 Woodberry, Baltimore, Md... *pp.* 196, 197

Rogers Machine Co., 25 Church St., New York
 Tool Steel Gear & Pinion Co., Station P, Cin-
 cinnati, O.

Turner, Vaughn & Taylor Co., Cuyahoga Falls,
 O.

WASHBURN & GRANGER, 50 Church St.,
 New York... *p.* 91

—Steel

CALDWELL CO., INC., W. E., 340 E. Brandeis
 St., Louisville, Ky... *p.* 201

DE LAVAL STEAM TURBINE CO., Trenton,
 N. J... *p.* 22

DODGE SALES & ENGINEERING CO.,
 Mishawaka, Ind... *pp.* 202, 203, 204, 205,
 206

FALK CO., Milwaukee, Wis... *pp.* 188, 189

Ganshow Co., Wm., Washington-Morgan St.,
 Chicago, Ill.

*GENERAL ELECTRIC CO., Schenectady,
 N. Y... *pp.* 20, 21, 521

HIMOFF MACHINE CO., 45-53 Mills St.,
 Astoria, New York... *p.* 350

*JAMES MFG. CO., D. O., 1118-24 W. Monroe
 St., Chicago, Ill... *pp.* 192, 193

JONES FOUNDRY & MACHINE CO., W. A.,
 4401 W. 12th St., Chicago, Ill... *p.* 194

*MORSE CHAIN CO., Ithaca, N. Y... *p.* 199

Nilson-Miller Co., 1300 Hudson St., Hoboken,
 N. J.

NUTTALL CO., R. D., Pittsburgh, Pa... *p.* 195

*POOLE ENGINEERING & MACHINE CO.,
 Woodberry, Baltimore, Md... *pp.* 196, 197

Sauer Power Generating Co., 5115 Rosetta St.,
 Pittsburgh, Pa.

VAN DORN & DUTTON CO., Cleveland, O.
 ... *p.* 370

—Tractor

Ganshow Co., Wm., Washington-Morgan St.,
 Chicago, Ill.

—Worm

Albro-Clem Elevator Co. (Hindley), Erie Ave.
 & D St., Philadelphia, Pa.

CALDWELL CO., INC., W. E., 340 E. Brandeis
 St., Louisville, Ky... *p.* 201

*CALDWELL & SON CO. H. W., 17th St. &
 Western Ave., Chicago, Ill... *p.* 250

*CHAIN BELT CO., 735 Park St., Milwaukee,
 Wis... *pp.* 118, 119

Cincinnati Gear Co., 1825 Reading Road, Cin-
 cinnati, O.

Cleveland Worm Gear Co., Cleveland, O.

DODGE SALES & ENGINEERING CO.,
 Mishawaka, Ind... *pp.* 202, 203, 204, 205,
 206

*FAWCUS MACHINE CO., Pittsburgh, Pa...
pp. 190, 191

Foote Bros. Gear & Machine Co., 213 N. Curtis
 St., Chicago, Ill.

Ganshow Co., Wm., Washington-Morgan St.,
 Chicago, Ill.

General Machinery Mfg. Co., 9th, Victor &
 Barton Sts., St. Louis, Mo.

Grant Gear Works, 151 Pearl St., Boston, Mass

HIMOFF MACHINE CO., 45-53 Mills St.,
 Astoria, New York... *p.* 350

Advertisements of firms marked * appear in the Journal, A. S. M. E.

Hindley Gear Co., 1105 Frankford Ave., Philadelphia, Pa.
 *JAMES MFG. CO., D. O., 1118-24 W. Monroe St., Chicago, Ill. . . . *pp.* 192, 193
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . . *p.* 194
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill. . . . *p.* 256
 Newark Gear Cutting Machine Co., 65-75 Prospect St., Newark, N. J.
 Nilson-Miller Co., 1300 Hudson St., Hoboken, N. J.
 NUTTALL CO., R. D., Pittsburgh, Pa. . . . *p.* 195
 *POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md. . . . *pp.* 196, 197
 VAN DORN & DUTTON CO., Cleveland, O. . . . *p.* 370
 WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill. . . . *pp.* 258, 259, 260
GENERATING SETS
 AMERICAN BLOWER CO., Detroit, Mich. . . . *pp.* 434, 435
 C & C Electric & Mfg. Co., Garwood, N. J.
 Engberg's Electric & Mechanical Works, 8 Vine St., St. Joseph, Mich.
 Fay & Bowen Engine Co., Geneva, N. Y.
 *GENERAL ELECTRIC CO., Schenectady, N. Y. . . . *pp.* 20, 21, 521
 Langstadt Meyer Co., Appleton, Wis.
 Matthews Engineering Co., Sandusky, O.
 Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
 Rochester Motos Co., Inc., Rochester, N. Y.
 SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York. . . . *p.* 505
 STURTEVANT CO., B. F., Hyde Park, Boston, Mass. . . . *pp.* 74, 75
 Universal Motor Co., Oshkosh, Wis.
 Weiss Engine Co., 17 Battery Place, New York
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . . *pp.* 114, 115
 Zin-Ho Brunner Fdry. & Mch. Co., 343 So. Dearborn St., Chicago, Ill.
GENERATOR COOLING SYSTEMS
 BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa. . . . *p.* 470
 *SPRAY ENGINEERING CO., 93 Federal St., Boston, Mass. . . . *p.* 113
GENERATORS
 —Acetylene
 Delcampe Welding Co., Bridgeport, Conn.
 MILBURN CO., ALEXANDER, Baltimore, Md. . . . *p.* 420
 Ottumwa-Moline Engine & Pump Co., Ottumwa, Ia.
 OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J. . . . *p.* 421
 Oxy-Carbi Co., New Haven, Conn.
 Thermalene Co., Chicago Heights, Ill.
 —Electric
 *ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. . . . *p.* 15
 C & C Electric & Mfg. Co., Garwood, N. J.
 Colonial Fan & Motor Co., Warren, O.
 Crocker-Wheeler Co., Ampere, N. J.
 Cushman Electric Co., 43 Main St., Concord, N. H.
 DE LAVAL STEAM TURBINE CO., Trenton, N. J. . . . *p.* 22
 Diehl Mfg. Co., Elizabethport, N. J.
 Dienelt & Eisenhardt, Inc., 1304 N. Howard St., Philadelphia, Pa.
 Eck Dynamo & Motor Co., Belleville, N. J.
 Electric Machinery Co., Minneapolis, Minn.
 Engberg's Electric & Mechanical Works, 8 Vine St., St. Joseph, Mich.
 Fairbanks-Morse & Co., 920 Wabash Ave., Chicago, Ill.
 Fidelity Electric Co., Lancaster, Pa.
 *GENERAL ELECTRIC CO., Schenectady, N. Y. . . . *pp.* 20, 21, 521
 Harris Incinerators-Steam Generator Co., 65 Life & Casualty Bldg., Nashville, Tenn.

Holt Electric Co., 377-379 S. Pierce St., Milwaukee, Wis.
 Ideal Electric & Mfg. Co., Mansfield, O.
 Kester Electric Co., Terre Haute, Ind.
 Mechanical Appliance Co., Milwaukee, Wis.
 Peerless Electric Co., Warren, O.
 Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, O.
 Ridgway Dynamo & Engine Co., Ridgway, Pa.
 Robbins & Myers Co., Springfield, O.
 Roth Bros. & Co., 1400 W. Adams St., Chicago, Ill.
 SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York. . . . *p.* 505
 Sprague Electric Works, 527 W. 34th St., New York
 STURTEVANT CO., B. F., Hyde Park, Boston, Mass. . . . *pp.* 74, 75
 Wells Mfg. Co., R. C., Fond du Lac, Wis.
 Western Electric Co., Inc., 195 Broadway, New York
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . . *pp.* 114, 115
 —Gas
 Thermalene Co., Chicago Heights, Ill.
 —Hydrogen
 Burdett Mfg. Co., 309 St. Johns Court, Chicago, Ill.
 Shriver & Co., T., 844 Hamilton St., Harrison, N. J.
 —Low Voltage
 *GENERAL ELECTRIC CO., Schenectady, N. Y. . . . *pp.* 20, 21, 521
 Jantz & Leist Electric Co., Cincinnati, O.
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . . *pp.* 114, 115
 —Oxy-Hydrogen
 International Oxygen Co., 115 Broadway, New York
GLASS BEVELING MACHINES
 Acton, John, 118 John St., Brooklyn, N. Y.
GLASS BLOWING
 Corning Glass Works, Corning, N. Y.
 Standard Scientific Co., 70 Fifth Ave., New York
GLASS BLOWING MACHINES
 Lynch Glass Machinery Co., Anderson, Ind.
GLASS CUTTING WHEELS
 NORTON CO., Worcester, Mass. . . . *p.* 391
GLASS WORKS MACHINERY
 Cox & Sons Co., 519 Lafayette Place, Philadelphia, Pa.
 Sommerfield Machine & Mfg. Co., 220 2nd Ave., Pittsburgh, Pa.
GLASSWARE (Technical)
 Corning Glass Works, Corning, N. Y.
 Eimer & Amend, 205 3rd Ave., New York
GOLD MILLING MACHINERY
 *FULLER-LEHIGH CO., Fullerton, Pa. . . . *p.* 92
GOVERNORS
 —Air Compressor
 IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J. . . . *p.* 145
 INGERSOLL-RAND CO., 11 Broadway, New York. . . . *pp.* 428, 429
 Jarecki Mfg. Co., Erie, Pa.
 Judson Governor Co., Rochester, N. Y.
 KIELEY & MUELLER, INC., 34 W. 13th St., New York. . . . *p.* 146
 WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa. . . . *pp.* 432, 433
 —Engine (Gas and Steam)
 Eclipse Governor Co., Vicksburg, Mich.
 Godfrey, Keeler Co., 70 Warren St., New York
 HOUSTON, STAMWOOD & GAMBLE CO., Cincinnati, O. . . . *pp.* 48, 49, 321
 IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J. . . . *p.* 145
 Jarecki Mfg. Co., Erie, Pa.
 KIELEY & MUELLER, INC., 34 W. 13th St., New York. . . . *p.* 146

Gov

See Catalogue Section for data of firms listed in capital type

GOVERNORS (Continued)—**Engine (Gas and Steam)**

Knowlson & Kelly, Troy, N. Y.
 Massey-Machine Co., Watertown, N. Y.
 PICKERING GOVERNOR CO., Portland, Conn... *p. 166*
 Sinker Davis Co., Indianapolis, Ind.
 Vicksburg Governor Co., Vicksburg, Mich.
 Waters Governor Co., 1122 Oliver Bldg., Boston, Mass.
 WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*
 Wright Machine Co., Owensboro, Ky.

—**Gas**

Atlas Valve Co., Inc., 90 West St., New York
 Luther Mfg. Co., Olean, N. Y.
 STEERE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich... *p. 503*
 WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*
 WILBRAHAM-GREEN BLOWER CO., Pottsville, Pa... *p. 437*

—**Oil Burner**

HAMMEL OIL BURNING EQUIPMENT CO., 409 Pine St., Providence, R. I... *p. 95*

—**Pump**

Acton, John, 118 John St., Brooklyn, N. Y.
 Albany Steam Trap Co., 317 N. Pearl St., Albany, N. Y.
 Berry Engineering Co. (Berry), Chester, Pa.
 Cash Co., A. W., Decatur, Ill.
 Central Machine Co., 7th, Wood & Franklin Sts., Philadelphia, Pa.
 Chaplin-Fulton Mfg. Co., 28 Penn Ave., Pittsburgh, Pa.
 D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass... *p. 144*
 Dunham Co., C. A., 1710 Fisher Bldg., Chicago, Ill.
 Fisher Governor Co., Marshalltown, Iowa
 FORD CO., THOMAS F., 407 Broome St., New York... *p. 125*

Gov

Foster Engineering Co., Newark, N. J.
 Gardner Governor Co., Quincy, Ill.
 HAMMEL OIL BURNING EQUIPMENT CO., 409 Pine St., Providence, R. I... *p. 95*
 IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J... *p. 145*
 KILEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*
 McDonough Automatic Regulator Co., 716 Grand River Ave., Detroit, Mich.
 Mason Regulator Co., Boston, Mass.
 Northern Equipment Co., Erie, Pa.
 Plouff Co., 1500 River St., Boston, Mass.
 RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *p. 170, 171*
 "S-C" REGULATOR MFG. CO., Fostoria, O... *p. 72*
 Shopp & Co., W. A. (Carr), New Castle, Ind.
 Squires Co., C. E., E. 40th St. & Kelley Ave., Cleveland, O.
 TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... *p. 535*
 Watson & McDaniel Co., 142 N. 7th St., Philadelphia, Pa.
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*
 Williams Gauge Co., 543 Fourth Ave., Pittsburgh, Pa.
 Ziermore Valve Co., Media, Pa.

—**Steam Turbine**

DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*
 IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J... *p. 145*
 Massey-Machine Co., Watertown, N. Y.
 PICKERING GOVERNOR CO., Portland, Conn... *p. 166*
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

—**Water Wheel**

LEFFEL & CO., JAMES, Springfield, O... *p. 453*
 Lombard Governor Co., Ashland, Mass.

PELTON WATER WHEEL CO., Harrison & 19th Sts., San Francisco, Cal... *p. 452*
 WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

GRADUATING MACHINES

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*
 Swedish Gage Co., Inc., 245 W. 55th St., New York

GRAIN ELEVATOR EQUIPMENT

LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*
 Union Iron Works, Decatur, Ill.
 WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp. 258, 259, 260*

GRANULATORS

STROUD & CO., E. H., 928 934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

—**Sugar**

Louisville Drying Machinery Co., 451 Baxter Ave., Louisville, Ky.

GRAPHITE—**Boiler**

American Graphite Co. of Philadelphia, Land Title Bldg., Philadelphia, Pa.
 Asbury Graphite Mills, Asbury, Warren Co., N. J.
 Columbia Graphite Co. Columbia Bldg., Cleveland, O.
 Dixon Crucible Co., Joseph, Jersey City, N. J.
 Federal Graphite Mills, Cleveland, O.
 Kelly Graphite Mills, 355 W. 26th St., New York
 Obermayer Co., S., Cincinnati, O.
 United States Graphite Co., Saginaw, Mich.

—**Flake (Lubricating)**

Asbury Graphite Mills, Asbury, Warren Co., N. J.
 Dixon Crucible Co., Joseph, Jersey City, N. J.
 Obermayer Co., S., Cincinnati, O.
 United States Graphite Co., Saginaw, Mich.

—**Powdered**

Acheson Graphite Co., Niagara Falls, N. Y.

GRATE BARS

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind... *p. 35*
 Beach Mfg. Co., Charlotte, Mich.
 BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa... *p. 886*
 Cantor Grate Co., 1708 Woodland Ave., Canton, O.
 *CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*
 Coe Co., C. T., 10-14 Johnson St., Newark, N. J.
 Crowe, Paul L., 33 Bidwell Ave., Jersey City, N. J.
 DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*
 Eureka Mfg. Co., Lincoln, N. C.
 GREEN ENGINEERING CO., 13 Kennedy Ave., East Chicago, Ind... *pp. 80, 81*
 Iron City Grate Bar Co., Warren, O.
 JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... *p. 194*
 Keystone Stoker Co., Greenfield, Mass.
 Kramer Bros., Foundry Co., Dayton, O.
 McCLAVE-BROOKS CO. (McClave's), Scranton, Pa... *p. 87*

Marion Machine Foundry & Supply Co., Marion, Ind.

Mershon Patent Shaking Grate Works, Third & Quarry Sts., Philadelphia, Pa.

Myerstown Foundry & Mfg. Co., Inc., 90 West St., New York

New England Roller Grate Co., Springfield, Mass.
 Parson Mfg. Co., 35 Nassau St., New York

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

Shevlin Engineering Co., Inc., 108 W. 34th St., New York

ST. JOHN GRATE BAR CO., Machinery Dept., The Bourse, Philadelphia, Pa... *p. 90*

THOMAS GRATE BAR CO., Birmingham, Ala... *pp. 88, 89*

UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*

WASHBURN & GRANGER, 50 Church St., New York... *p. 91*

GRATE SHAKERS, POWER (Locomotive)
Franklin Railway Supply Co., 30 Church St., New York

GRATES

—Dumping

BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa... *p. 86*

Canton Grate Co., 1708 Woodland Ave., Canton, O.

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

Combustion Engineering Corp'n, 11 Broadway, New York

Cyclone Grate Bar Co., Buffalo, N. Y.

FROST MFG. CO., 112 Adams St., Chicago, Ill... *pp. 47, 462*

Godfrey, Keeler Co., 70 Warren St., New York
Herrick, Geo. S., 132 N. Warren St., Syracuse, N. Y.

Hofft Co., M. A., Indianapolis, Ind.

KEELER CO., E., Williamsport, Pa... *p. 51*

Kelly Foundry & Machine Co., E. Purl St., Goshen, Ind.

Kramer Bros. Foundry Co., Dayton, O.

McCLAVE-BROOKS CO. (McClave's), Scranton, Pa... *p. 87*

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p. 496*

Martin Grate Co., 343 S. Dearborn St., Chicago, Ill.

Mershon Patent Shaking Grate Works, Third & Quarry Sts., Philadelphia, Pa.

Nemes Bros., 206-214 1st St., Troy, N. Y.

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

Shevlin Engineering Co., Inc., 108 W. 34th St., New York

STERLING BLOWER CO., Hartford, Conn... *p. 436*

Thacher & Co., George H., Albany, N. Y.

THOMAS GRATE BAR CO., Birmingham, Ala... *pp. 88, 89*

Treadwell Co., M. H., 140 Cedar St., New York

VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*

WASHBURN & GRANGER, 50 Church St., New York... *p. 81*

—Kiln

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

McCLAVE-BROOKS CO. (McClave's), Scranton, Pa... *p. 87*

Mershon Patent Shaking Grate Works, Third & Quarry Sts., Philadelphia, Pa.

WASHBURN & GRANGER, 50 Church St., New York... *p. 91*

—Shaking

AUTOMATIC FURNACE CO., Dayton, O... *p. 78*

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind... *p. 35*

Blakeslee Mfg. Co., DuQuoin, Ill.

BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa... *p. 86*

Canton Grate Co., 1708 Woodland Ave., Canton, O.

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

Cokal Stoker Co., Chicago, Ill.

Combustion Engineering Corp'n, 11 Broadway, New York

Cyclone Grate Bar Co., Buffalo, N. Y.

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*

FROST MFG. CO., 112 W. Adams St., Chicago, Ill... *pp. 47, 462*

Godfrey, Keeler Co., 70 Warren St., New York

Hafer Foundry & Machine Works, Chambersburg, Pa.

Herrick, Geo. S., 132 N. Warren St., Syracuse, N. Y.

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

Improved Combustion Co., 355 Peoples Gas Bldg., Chicago, Ill.

KEELER CO., E., Williamsport, Pa... *p. 51*

Kramer Bros. Foundry Co., Dayton, O.

McCLAVE-BROOKS CO. (McClave's), Scranton, Pa... *p. 87*

McMillan & Co., James, 114 Clark Court, Chicago, Ill.

McNaughton Mfg. Co., Maryville, Tenn.

Marion Machine Foundry & Supply Co., Marion, Ind.

Martin Grate Co., 343 S. Dearborn St., Chicago, Ill.

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p. 496*

Mershon Patent Shaking Grate Works, Third & Quarry Sts., Philadelphia, Pa.

National Foundry Mfg. & Supply Co., Williamsport, Pa.

Nemes Bros., 206-214 1st St., Troy, N. Y.

New England Roller Grate Co., Springfield, Mass.

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

Power Efficiency Corp'n, White Bldg., Buffalo, N. Y.

Power Engineering Co., Railway Exchange, Chicago, Ill.

Reagan Grate Bar Co., 209 N. Front St., Philadelphia, Pa.

*SPRINGFIELD BOILER CO., Springfield, Ill... *p. 60*

ST. JOHN GRATE BAR CO., Machinery Dept., The Bourse, Philadelphia, Pa... *p. 90*

THOMAS GRATE BAR CO., Birmingham, Ala... *pp. 88, 89*

Thacher & Co., George H., Albany, N. Y.

Travis, G. E., Henry, Ill.

Twin Fire Furnace Co., 1252 First National Bank Bldg., Chicago, Ill.

U. S. Rocking Grate Bar Co., 20 West Jackson Blvd., Chicago, Ill.

VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*

WASHBURN & GRANGER, 50 Church St., New York... *p. 91*

*WICKES BOILER CO., Saginaw, Mich... *p. 66*

—Shaking, Circular

Mershon Patent Shaking Grate Works, Third & Quarry Sts., Philadelphia, Pa.

—Traveling

AUTOMATIC FURNACE CO., Dayton, O... *p. 78*

*GREEN ENGINEERING CO., 13 Kennedy Ave., East Chicago, Ind... *pp. 80, 81*

—Water Tube

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

KEELER CO., E., Williamsport, Pa... *p. 51*

VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*

Swan, John F., 10th St. & Duncannon Ave., Philadelphia, Pa.

GRAVEL SCREENING PLANTS

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

Dull Co., Raymond W., 111 W. Washington St., Chicago, Ill.

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*

Stephens-Adamson Mfg. Co., Aurora, Ill.

GREASE

ALBANY LUBRICATING CO., 708-10 Washington St., New York... *p. 173*

Borne, Scrymser Co., 80 South St., New York

Dexter Oil Co., 313 Sixth Ave., Pittsburgh, Pa.

Engineering Supply Co., 2238 N. 9th St., Philadelphia, Pa.

Franklin Oil & Gas Co., Bedford, O.

Houghton & Co., E. F., 240 W. Somerset St., Philadelphia, Pa.

Keystone Lubricating Co., 21st, Clearfield & Lippincott Sts., Philadelphia, Pa.

Monarch Mfg. Co., Toledo, O.

Gre

GREASE (Continued)

Moore Oil Co., York St. & McLean Ave., Cincinnati, O.
 New York & New Jersey Lubricant Co., 165 Broadway, New York
 Ohio Grease Co., Loudonville, O.
 Philadelphia Grease Mfg. Co., 848-850 S. Swanson St., Philadelphia, Pa.
 Robinson & Son Co., Wm. C., 32 South St., Baltimore, Md.
 Standard Oil Co. of New York, 26 Broadway, New York
 Star Oil Co., 440 N. Halsted St., Chicago, Ill.
 SWAN & FINCH CO. (Cupesc), 165 Broadway, New York... *p. 174*
 Symonds Co., Joseph H., Melrose, Mass.
 *THE TEXAS COMPANY (Texaco), 17 Battery Place, New York... *p. 175*
 TIDE WATER OIL CO. (Veedol), 11 Broadway, New York... *p. 176*
 Valvoline Oil Co., 11 Broadway, New York
 Wolverine Lubricants Co. of N. Y., 80 Broad St., New York

—Graphite

Acheson Graphite Co. (Gredag), Niagara Falls, N. Y.
 ALBANY LUBRICATING CO., 708-10 Washington St., New York... *p. 173*
 Harris Oil Co., A. W., 326 S. Water St., Providence, R. I.
 Kelly Graphite Mills, 355 W. 26th St., New York
 United States Graphite Co., Saginaw, Mich.

GREASE CUPS

(See Oil and Grease Cups)

GRINDERS**—Food**

STROUD & Co., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

—Nail Die

SLEEPER & HARTLEY, INC., Worcester, Mass... *p. 486*

Star Mfg. Co., New Lexington, O.

—Saw

ATKINS & CO., INC., E. C., Indianapolis, Ind... *p. 385*

Hunter Saw & Machine Co., 57th & Butler Sts., Pittsburgh, Pa.

Wardwell Mfg. Co., 110-112 Hamilton Ave., Cleveland, O.

—Wood

Carthage Machine Co., Carthage, N. Y.
 Mitts & Merrill, 816 S. Franklin St., Saginaw, Mich.

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

STROUD & Co., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

GRINDING AND SCREEN SEPARATION MACHINERY

Ehram & Sons Mfg. Co., J. B., Enterprise, Kan.
 *FULLER-LEHIGH CO., Fullerton Pa... *p. 92*

STROUD & Co., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

*WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill... *pp. 468, 469*

GRINDING MACHINERY

Abbe, Paul O., 30 Broad St., New York
 BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

Bauer Bros. Co., Springfield, O.

*BROWN CO., A. & F., 79 Barclay St., New York... *p. 187*

Holmes & Blanchard Co., 31 State St., Boston, Mass.

Provost Engineering Corp'n, 220 Broadway, Brooklyn, N. Y.

Ross & Son Co., Chas., 148-156 Classon Ave., Brooklyn, N. Y.

Sackett, A. J., 5th Ave. & First St., Baltimore, Md.

Stevenson Co., Wellsville, O.

STROUD & Co., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

Sturtevant Mill Co., Harrison Sq., Boston, Mass.

GRINDING MACHINES**—Bench**

*BUILDERS IRON FOUNDRY, Providence, R. I... *p. 520*

CHALLENGE MACHINE CO., Philadelphia, Pa... *p. 388*

Clizbe Bros. Mfg. Co., Plymouth, Ind.

Forbes & Myers, 173 Union St., Worcester, Mass.

Hisey Wolf Machine Co., Cincinnati, O.

NOBLE & WESTBROOK MFG. CO., Hartford, Conn... *p. 368*

NORTON GRINDING CO., Worcester, Mass... *p. 362*

Partridge, E. O., 2047-2049 W. Lake St., Chicago, Ill.

PRATT & WHITNEY CO., 111 Broadway, New York... *p. 344*

Ransom Mfg. Co., Oshkosh, Wis.

*ROYERSFORD FOUNDRY & MACHINE CO., 52 N. 5th St., Philadelphia, Pa... *pp. 228, 229*

Standard Electric Tool Co., Cincinnati, O.

WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O... *p. 365*

—Cam

LANDIS TOOL CO., Waynesboro, Pa... *p. 359*

NORTON GRINDING CO., Worcester, Mass... *p. 362*

—Car Wheel

NORTON GRINDING CO., Worcester, Mass... *p. 362*

—Chaser

International Equipment Co., 1932-1934 Arch St., Philadelphia, Pa.

LANDIS MACHINE CO., INC., Waynesboro, Pa... *pp. 372, 373*

MODERN TOOL CO., Erie, Pa... *pp. 360, 361*

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

—Chucking

Bryant Chucking Grinder Co., Springfield, Vt.

—Crank Shaft

LANDIS TOOL CO., Waynesboro, Pa... *p. 359*

McDonough Mfg. Co., Eau Claire, Wis.

MODERN TOOL CO., Erie, Pa... *pp. 360, 361*

NORTON GRINDING CO., Worcester, Mass... *p. 362*

—Cutlery

Hemming Bros. Co., Inc., New Haven, Conn.

—Cutter and Reamer

Cincinnati Milling Machine Co., Cincinnati, O.

Clough, R. M., Meriden, Conn.

Grand Rapids Grinding Machine Co., 31 Ottawa Ave., N. W., Grand Rapids, Mich.

Greenfield Machine Co., 36 Haywood St., Greenfield, Mass.

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass... *pp. 374, 375*

Harris Engrg. Co., H. E., 1047 Broad St., Bridgeport, Conn.

Ingersoll Milling Machine Co., Rockford, Ill.

LANDIS TOOL CO., Waynesboro, Pa... *p. 359*

LeBlond Machine Tool Co., R. K., Cincinnati, O.

McDonough Mfg. Co., Eau Claire, Wis.

Matson Machine Co., Concord, N. H.

NORTON GRINDING CO., Worcester, Mass... *p. 362*

Oakley Machine Tool Co., Oakley, Cincinnati, O.

Oesterlein Machine Co., 3301 Colerain Ave., Cincinnati, O.

UNIVERSAL GRINDING MACHINE CO., Fitchburg, Mass... *p. 364*

Woods Engineering Co., 108 Patterson St., Alliance, O.

—Cylindrical

Cincinnati Grinder Co., 3233 Colerain Ave., Cincinnati, O.

Gre

Fitchburg Grinding Machine Co., 76 Winter St., Fitchburg, Mass.
 Greenfield Machine Co., 36 Haywood St., Greenfield, Mass.
LANDIS TOOL CO., Waynesboro, Pa... *p. 359*
 McDonough Mfg. Co., Eau Claire, Wis.
MODERN TOOL CO., Erie, Pa... *pp. 360, 361*
NORTON GRINDING CO., Worcester, Mass... *p. 362*
OTT GRINDER CO., Indianapolis, Ind... *p. 363*
PRATT & WHITNEY CO., 111 Broadway, New York... *p. 344*
 Queen City Machine Tool Co., 1405 Sycamore St., Cincinnati, O.
UNIVERSAL GRINDING MACHINE CO., Fitchburg, Mass... *p. 364*
WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O... *p. 365*

—**Disc**
 Diamond Machine Co., Providence, R. I.
 Gardner Machine Co., Beloit, Wis.
LANDIS TOOL CO., Waynesboro, Pa... *p. 359*
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

—**Drill**
 Grand Rapids Grinding Machine Co., 31 Ottawa Ave., N. W., Grand Rapids, Mich.
 La Salle Machine Tool Co., La Salle, Ill.
LANDIS TOOL CO., Waynesboro, Pa... *p. 359*
 Washburn Shops of the Worcester Polytechnic Institute, Worcester, Mass.
 Wilmarth & Morman Co., 580 Canal St., Grand Rapids, Mich.

—**Electric, Portable**
 Cincinnati Electrical Tool Co., Freeman & Flint Sts., Cincinnati, O.
 Clark, Jr., Electric Co., Jas., 520 W. Main St., Louisville, Ky.
 Coates Clipper Mfg. Co., 237 Chandler St., Worcester, Mass.
 Electro-Magnetic Tool Co., 2902 Carroll Ave., Chicago, Ill.
 Hisey Wolf Machine Co., Cincinnati, O.
 Neil & Smith Electric Tool Co., Cincinnati, O.
 Standard Electric Tool Co., Cincinnati, O.
 Temco Electric Motor Co., 66 Sugar St., Leipsic, O.
 United States Electrical Tool Co., Cincinnati, O.
 Universal Electric Co., 9 Oliver St., Newark, N. J.
VAN DORN ELECTRIC TOOL CO., Cleveland, Ohio... *p. 370*
***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa... *pp. 114, 115*
WISCONSIN ELECTRIC CO., Racine, Wis... *p. 371*

—**Flexible Shaft, Portable**
 Stow Flexible Shaft Co., 26th & Callowhill Sts., Philadelphia, Pa.
 Webb Mfg. Co., Foot of Centre St., Newark, N. J.

—**Floor**
 Blevney Machine Co., Greenfield, Mass.
 Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
***BUILDERS IRON FOUNDRY**, Providence, R. I... *p. 520*
CHALLENGE MACHINE CO., Philadelphia, Pa... *p. 388*
 Hoppen & Sons, J. E. (Hoppen), Belleville, N. J.
NOBLE & WESTBROOK MFG. CO., Hartford, Conn... *p. 368*
NORTON GRINDING CO., Worcester, Mass... *p. 362*
 Partridge, E. O., 2047-2049 W. Lake St., Chicago, Ill.
 Ransom Mfg. Co., Oshkosh, Wis.
 St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo.
STERLING GRINDING WHEEL CO., Tiffin, O... *p. 392*
 Springfield Mfg. Co., 317 Mt. Grove St., Bridgeport, Conn.

Standard Electric Tool Co., Cincinnati, O.
 Wade, Walter H., 311 Atlantic Ave., Boston, Mass.
WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O... *p. 365*

—**Hole and Face**
 Bryant Chucking Grinder Co., Springfield, Vt.
LANDIS TOOL CO., Waynesboro, Pa... *p. 359*

—**Internal**
 Bryant Chucking Grinder Co., Springfield, Vt.
 Cincinnati Grinder Co., 3233 Colerain Ave., Cincinnati, O.
 Fraser Co., Warren F., Westbar, Mass.
 Heald Machine Co., Worcester, Mass.
LANDIS TOOL CO., Waynesboro, Pa... *p. 359*
 Lansing Stamping Co., Lansing, Mich.
MODERN TOOL CO., Erie, Pa... *pp. 360, 361*
OTT GRINDER CO., Indianapolis, Ind... *p. 363*
 Rivett Lathe & Grinder Co., Brighton, Boston, Mass.
SLOCUM, AVRAM & SLOCUM LABORATORIES, INC., 531-537 W. 21st St., New York... *p. 538*
UNIVERSAL GRINDING MACHINE CO., Fitchburg, Mass... *p. 364*
 Van Norman Machine Tool Co., Springfield, Mass.

—**Knife**
ATKINS & CO., INC., E. C., Indianapolis, Ind... *p. 385*
 Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
 Stockbridge Machine Co., Worcester, Mass.
 Wardwell Mfg. Co., 110-112 Hamilton Ave., Cleveland, O.

—**Pattern Makers' (Disc)**
 Gardner Machine Co., Beloit, Wis.

—**Piston**
LANDIS TOOL CO., Waynesboro, Pa... *p. 359*
MODERN TOOL CO., Erie, Pa... *pp. 360, 361*
NORTON GRINDING CO., Worcester, Mass... *p. 362*
 Persons-Arter Machine Co., 72 Commercial St., Worcester, Mass.

—**Piston Ring**
MODERN TOOL CO., Erie, Pa... *pp. 360, 361*

—**Pneumatic, Portable**
INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*

—**Profile**
 Barnes, William O., Leominster, Mass.
 Cleveland Milling Machine Co., 18511 Euclid Ave., Cleveland, O.
 Fischer Machine Co., 310-316 N. 11th St., Philadelphia, Pa.
 Wade, Walter H., 311 Atlantic Ave., Boston, Mass.

—**Radial**
LANDIS TOOL CO., Waynesboro, Pa... *p. 359*
 Rivett Lathe and Grinder Co., Brighton, Boston, Mass.
 Van Norman Machine Tool Co., Springfield, Mass.

—**Ring Wheel**
 Gardner Machine Co., Beloit, Wis.

—**Roll**
 Hampden Corundum Wheel Co., Springfield, Mass.
LANDIS TOOL CO., Waynesboro, Pa... *p. 359*
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*
NORTON GRINDING CO., Worcester, Mass... *p. 362*

—**Surface**
 Abrasive Machine Tool Co., East Providence, R. I.
BLAKE & JOHNSON CO., Waterbury, Conn... *p. 482*

Gri

See Catalogue Section for data of firms listed in capital type

GRINDING MACHINES (Continued)**—Surface**

BLANCHARD MACHINE CO., Cambridge, Mass... p. 358

Bristol Machine Tool Co., Bristol, Conn.

Brown & Sharpe Mfg. Co., Promenade St., Providence, R. I.

Diamond Machine Co., Providence, R. I.

Greenlee Bros. & Co., Rockford, Ill.

Heald Machine Co., Worcester, Mass.

La Salle Machine Tool Co. (La Salle), La Salle, Ill.

LANDIS TOOL CO., Waynesboro, Pa... p. 359

Leavitt Mfg. Co., Urbana, Ill.

LYND-FARQUHAR CO., Boston, Mass... p. 348

National Machine Co., 135 Sheldon St., Hartford, Conn.

NOBLE & WESTBROOK MFG. CO., Hartford, Conn... p. 368

NORTON GRINDING CO., Worcester, Mass... p. 362

Persons-Arter Machine Co., 72 Commercial St., Worcester, Mass.

PRATT & WHITNEY CO., 111 Broadway, New York... p. 344

Reed-Prentice Co., Worcester, Mass.

Springfield Mfg. Co., 317 Mt. Grove St., Bridgeport, Conn.

Standard Electric Tool Co., Cincinnati, O.

Universal Electric Co., 9 Oliver St., Newark, N. J.

UNIVERSAL GRINDING MACHINE CO., Fitchburg, Mass... p. 364

Walker Co., O. S., Worcester, Mass.

Wilmarth & Morman Co., 580 Canal St., Grand Rapids, Mich.

—Tool

BLAKE & JOHNSON CO., Waterbury, Conn... p. 482

Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

***BUILDERS IRON FOUNDRY**, Providence, R. I... p. 520

CHALLENGE MACHINE CO., Philadelphia, Pa... p. 388

Clibbe Bros. Mfg. Co., Plymouth, Ind.

Diamond Machine Co., Providence, R. I.

Forbes & Myers, 173 Union St., Worcester, Mass.

Gale-Sawyer Co., 33 Wormwood St., Boston, Mass.

Gisholt Machine Co., Madison, Wis.

Grand Rapids Grinding Machine Co., 31 Ottawa Ave., N. W., Grand Rapids, Mich.

LANDIS TOOL CO., Waynesboro, Pa... p. 359

La Salle Machine Tool Co., La Salle, Ill.

MODERN TOOL CO., Erie, Pa... pp. 360, 361

NATIONAL ACME CO., Cleveland, O... pp. 334, 335

NILES-BEMENT-POND CO., 111 Broadway, New York... p. 344

NOBLE & WESTBROOK MFG. CO., Hartford, Conn... p. 368

Partridge, E. O., 2047-49 W. Lake St., Chicago, Ill.

Ransom Mfg. Co., Oshkosh, Wis.

***ROVERS FORD FOUNDRY & MACHINE CO.**, 52 N. 5th St., Philadelphia, Pa... pp. 228, 229

Springfield Mfg. Co., 317 Mt. Grove St., Bridgeport, Conn.

STERLING GRINDING WHEEL CO., Tiffin, O... p. 392

Tabor Mfg. Co., 18th & Hamilton Sts., Philadelphia, Pa.

Taylor & Penn Co., Hartford, Conn.

WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O... p. 365

—Universal

Brown & Sharpe Mfg. Co., Promenade St., Providence, R. I.

CHALLENGE MACHINE CO., Philadelphia, Pa... p. 388

Cincinnati Grinder Co., 3233 Colerain Ave., Cincinnati, O.

Fraser Co., Warren P., Westbar, Mass.

Grand Rapids Grinding Machine Co., 31 Ottawa Ave., N. W., Grand Rapids, Mich.

Greenfield Machine Co., 36 Haywood St., Greenfield, Mass.

***GREENFIELD TAP & DIE CORP'N**, Greenfield, Mass... pp. 374, 375

LANDIS TOOL CO., Waynesboro, Pa... p. 359

MODERN TOOL CO., Erie, Pa... pp. 360, 361

NILES-BEMENT-POND CO., 111 Broadway, New York... p. 344

OTT GRINDER CO., Indianapolis, Ind... p. 363

Taft-Peirce Mfg. Co., Woonsocket, R. I.

UNIVERSAL GRINDING MACHINE CO., Fitchburg, Mass... p. 364

Valley City Machine Works, 12-16 Campan Ave., Grand Rapids, Mich.

Walker Co., O. S., Worcester, Mass.

WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O... p. 365

Wilmarth & Morman Co., 580 Canal St., Grand Rapids, Mich.

Woods Engineering Co., 108 Patterson St., Alliance, O.

GRINDING PANS

(See Pans, Grinding)

GRINDING WHEEL DRESSERS

Calder, George H., Lancaster, Pa.

CHALLENGE MACHINE CO., Philadelphia, Pa... p. 388

Desmond-Stephan Mfg. Co., Urbana, O.

MARK MFG. CO., P. O. Box G, Chicago, Ill. p. 160

Meyers Co., W. F., Bedford, Ind.

NORTON CO., Worcester, Mass... p. 391

NORTON GRINDING CO., Worcester, Mass... p. 362

STERLING GRINDING WHEEL CO., Tiffin, O... p. 392

GRINDING WHEELS

Abrasive Co., Bridesburg, Philadelphia, Pa.

American Emery Wheel Works, Providence, R. I.

Bay State Emery Wheel Co., Worcester, Mass.

Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

CARBORUNDUM CO., Niagara Falls, N. Y... p. 389

Chicago Wheel & Mfg. Co., 1101-1103 W. Monroe St., Chicago, Ill.

Commercial Corundum & Emery Wheel Co., 920-922 W. Ohio St., Chicago, Ill.

Detroit Grinding Wheel Co., Detroit, Mich.

Divine Bros. Co., Utica, N. Y.

Hampden Corundum Wheel Co., Springfield, Mass.

MAXF GRINDING WHEEL CORP'N, Chester, Mass... p. 390

National Grinding Wheel Co., Inc., 2984 Main St., Buffalo, N. Y.

NORTON CO., Worcester, Mass... p. 391

Peninsular Emery Wheel Co., 253 Midrum Ave., Detroit, Mich.

Pittsburgh Grinding Wheel Co., Rochester, Pa.

Safety Emery Wheel Co., Springfield, O.

Star Corundum Wheel Co., 241-261 Cavalry Ave., Detroit, Mich.

STERLING GRINDING WHEEL CO., Tiffin, O... p. 392

Superior Corundum Wheel Co., Waltham, Mass.

Vitrified Wheel Co., Westfield, Mass.

Waltham Grinding Wheel Co., Waltham, Mass.

White Dental Mfg. Co., S. S., 211 S. 12th St., Philadelphia, Pa.

White Heat Products Co., Frazer, Pa.

—Carborundum

American Emery Wheel Works, Providence, R. I.

CARBORUNDUM CO., Niagara Falls, N. Y. p. 389

Detroit Grinding Wheel Co., Detroit, Mich.

Star Corundum Wheel Co., 241-261 Cavalry Ave., Detroit, Mich.

Gri

-Corundum

American Emery Wheel Works, Providence, R. I.
 Bay State Emery Wheel Co., Worcester, Mass.
 Detroit Grinding Wheel Co., Detroit, Mich.
MAXF GRINDING WHEEL CORP'N, Chester, Mass... *p. 390*
 Star Corundum Wheel Co., 241-261 Cavalry Ave., Detroit, Mich.
STERLING GRINDING WHEEL CO., Tiffin, O... *p. 392*

-Elastic

Bay State Emery Wheel Co., Worcester, Mass.
MAXF GRINDING WHEEL CORP'N, Chester, Mass... *p. 390*
NORTON CO., Worcester, Mass... *p. 391*

-Emery

Bay State Emery Wheel Co., Worcester, Mass.
 Detroit Grinding Wheel Co., Detroit, Mich.
 Robertson Machine & Foundry Co., W., 56 58 Rano St., Buffalo, N. Y.
STERLING GRINDING WHEEL CO., Tiffin, O... *p. 392*
 Walls Tool & Supply Co., T. P., 75-77 Walker St., New York

White Heat Products Co., Frazier, Pa.
GRINDSTONES, MOUNTED
 Athol Machine Co., Athol, Mass.
 Hoppen & Sons, J. E., Belleville, N. J.

GROOVERS

HUTHER BROS. SAW MFG. CO., Rochester, N. Y... *p. 386*
GUN MAKING MACHINERY
HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*
NOBLE & WESTBROOK MFG. CO., Hartford, Conn... *p. 368*
 Winchester Repating Arms Co., New Haven, Conn.

GUN METAL FINISH

***AMERICAN METAL TREATMENT CO.**, Elizabeth, N. J... *p. 418*

H**HACK SAW BLADES**

(See Saw Blades, Hack)

HAIR FELT

Kearbey Co., Robert A., 445 West St., New York

HAMMERS**-Belt Driven**

***BEAUDRY & CO., INC.**, 141 Milk St., Boston, Mass... *p. 315*
BRADLEY & SON, INC., C. C., Syracuse, N. Y... *p. 316*

-Drop

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*
 Chambersburg Engineering Co., Chambersburg, Pa.
 Cleveland Machine & Mfg. Co., 4938-4952 Hamilton Ave., Cleveland, O.
 Massillon Foundry & Machine Co., Massillon, O.
 Merrill Bros., Maspeeth, N. Y.
 Miner & Peck Mfg. Co., New Haven, Conn.
NAZEL ENGINEERING & MACHINE WORKS, 4040 N. 5th St., Philadelphia, Pa... *p. 317*
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*
 Standard Machinery Co., Auburn, R. I.
TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

-Drop (Automatic)
BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*
 Miner & Peck Mfg. Co., New Haven, Conn.
TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

-Drop (Automatic)
BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*
 Miner & Peck Mfg. Co., New Haven, Conn.
TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

-Drop (Automatic)
BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*
 Miner & Peck Mfg. Co., New Haven, Conn.
TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

See Catalogue Section for data of firms listed in capital type

-Drop (Board)

Chambersburg Engineering Co., Chambersburg, Pa.

-Motor Driven

***BEAUDRY & CO., INC.**, 141 Milk St., Boston, Mass... *p. 315*
NAZEL ENGINEERING & MACHINE WORKS, 4040 N. 5th St., Philadelphia, Pa... *p. 317*

-Pneumatic

Barr, H. Edsill, Erie, Pa.
 Dayton Pneumatic Tool Co., Dayton, O.
INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*
NAZEL ENGINEERING & MACHINE WORKS, 4040 N. 5th St., Philadelphia, Pa... *p. 317*
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

-Power

Barr, H. Edsill, Erie, Pa.
***BEAUDRY & CO., INC.**, 141 Milk St., Boston, Mass... *p. 315*
BRADLEY & SON, INC., C. C., Syracuse, N. Y... *p. 316*
 Buffalo Foundry & Machine Co., E. Perry St. & Fillmore Ave., Buffalo, N. Y.
 Dienelt & Eisenhardt, Inc., 1304 N. Howard St., Philadelphia, Pa.
 Justice & Co., P. S. (Justice), 421 Chestnut St., Philadelphia, Pa.
 Little Giant Company, Mankato, Minn.
NAZEL ENGINEERING & MACHINE WORKS, 4040 N. 5th St., Philadelphia, Pa... *p. 317*
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*
 Novelty Iron Works Co., Dyersville, Ia.
 Scranton & Co., 42 Church St., New Haven, Conn.
 United Hammer Co., Oliver Bldg., Boston, Mass.
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

-Riveting and Chipping
 Cleveland Pneumatic Tool Co., 6410 Hawthorne Ave., Cleveland, O.
 Electro Magnetic Tool Co., 2902 Carroll Ave., Chicago, Ill.
 Helwig Mfg. Co., St. Paul, Minn.
INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*
 Oldham & Son Co., George, 4316-22 Tackawanna St., Frankford, Philadelphia, Pa.
 Pittsburgh Pneumatic Co., Canton, O.

-Rotary Riveting
 High Speed Hammer Co., St. Paul St. & Ave. E., Rochester, N. Y.
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

-Steam

Chambersburg Engineering Co., Chambersburg, Pa.
 Cleveland Machine & Mfg. Co., 4938-4952 Hamilton Ave., Cleveland, O.
 McDougall & Potter Co., 606-612 W. 55th St., New York
 Masillon Foundry & Machine Co., Massillon, O.
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

-Steam (Double Frame)

Massillon Foundry & Machine Co., Massillon, O.
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

-Steam (Double Frame)

Massillon Foundry & Machine Co., Massillon, O.
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

-Steam (Double Frame)

Massillon Foundry & Machine Co., Massillon, O.
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

HANDLES, MACHINE (Steel)

CINCINNATI BALL CRANK CO., Cincinnati, O... *p. 398*
CINCINNATI SCREW CO., Twilight, O. (Cincinnati suburb)... *p. 402*
WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... *p. 397*

HANGERS**-Cable**

Cameron Appliance Co. (Bonita), Everett, Mass.

Han

HANGERS (Continued)**—Door**

COBURN TROLLEY TRACK MFG. CO., Holyoke, Mass., *p. 276*
Richards-Wilcox Mfg. Co., Aurora, Ill.

—Pipe

***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill., *pp. 120, 121, 122, 123*
Hawkins Pump Works, Downers Grove, Ill.
 ***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa., *pp. 132, 133*
SIMMONS CO., JOHN, 110 Center St., New York, *p. 515*

—Shaft

Bond Foundry and Machine Co., Manheim, Pa.
 ***BROWN CO.**, A. & F., 79 Barclay St., New York, *p. 187*
CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky., *p. 201*
 ***CHAIN BELT CO.**, 735 Park St., Milwaukee, Wis., *pp. 118, 119*
Dick, Ltd., R. & J., Passaic, N. J.
DODGE SALES & ENGINEERING CO., Mishawaka, Ind., *pp. 202, 203, 204, 205, 206*
 ***FALLS CLUTCH & MACHINERY CO.**, Cuyahoga Falls, O., *p. 207*
Fairmount Foundry & Engineering Works, Woonsocket, R. I.
 ***HILL CLUTCH CO.**, Cleveland, O., *p. 208*
 ***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill., *p. 256*

Medart Patent Pulley Co., St. Louis, Mo.
Naylor Bros., Peekskill, N. Y.
Olney & Warrin, 406-412 Broome St., New York
 ***ROVERS FORD FOUNDRY & MACHINE CO.**, 52 N. 5th St., Philadelphia, Pa., *pp. 228, 229*

Standard Pressed Steel Co., 20th & Clearfield Sts., Philadelphia, Pa.
Upton & Gilman Machine Co., 587 Middlesex St., Lowell, Mass.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill., *pp. 258, 259, 260*

—Shaft (Ball and Roller Bearing)

***GURNEY BALL BEARING CO.**, Jamestown, N. Y., *pp. 218, 219*
S K F BALL BEARING CO. (S K F), Hartford, Conn., *p. 227*

Transmission Ball Bearing Co., Inc., 1050 Military Road, Buffalo, N. Y.

HARDENING

***AMERICAN METAL TREATMENT CO.**, Elizabeth, N. J., *p. 418*
Bidle Co., W. S., 1411 E. 45th St., Cleveland, O.
Durbrow & Hearne Mfg. Co., 12 Wooster St., New York.

ROCKWELL CO., W. S., 50 Church St., New York, *p. 413*

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y., *p. 397*

HARDNESS MEASURING INSTRUMENTS

(See Instruments, Hardness, Measuring)

HEADERS**—Bolt (Hand)**

Brown Co., H. B., East Hampton, Conn.

—Welded

Ballwood Co., 30 Church St., New York
 ***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill., *pp. 120, 121, 122, 123*
Mitchell & Co., W. K., 2940 Ellsworth St., Philadelphia, Pa.

***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa., *pp. 132, 133*
Shaw-Kendall Engineering Co., 120 S. Superior St., Toledo, O.
Simmons Pipe Bending Works, 41 Mechanic St., Newark, N. J.

HEADING MACHINES (Cold)

Cook Co., Asa S., Hartford, Conn.
NILES-BEMENT-POND CO., 111 Broadway, New York, *p. 344*

HEADING, UPSETTING AND FORGING MACHINES

Manville Machine Co., E. J., Waterbury, Conn.

NILES-BEMENT-POND CO., 111 Broadway, New York, *p. 344*

HEADS, FLANGED AND DISHED

Central Iron & Steel Co., Harrisburg, Pa.
GLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa., *p. 68*

LUKENS STEEL CO., Coatesville, Pa., *p. 69*
McAleghan Bros., Co., 25th & R. R. Sts., Pittsburgh, Pa.

PHOENIX IRON WORKS CO., Meadville, Pa., *p. 497*

HEAT TREATING

***AMERICAN METAL TREATMENT CO.**, Elizabeth, N. J., *p. 418*

Bidle Co., W. S., 1411 E. 45th St., Cleveland, O.
Connecticut Metal Treating Co., Inc., 207 Knowlton St., Bridgeport, Conn.

Footo Bros. Gear & Machine Co., 213 N. Curtis St., Chicago, Ill.

KENWORTHY, INC., CHARLES F., Waterbury, Conn., *pp. 414, 415*

Plumb, Fayette R., Bridesburg P. O., Philadelphia, Pa.

ROCKWELL CO., W. S., 50 Church St., New York, *p. 413*

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y., *p. 397*

Winchester Repeating Arms Co., New Haven, Conn.

HEATERS**—Asphalt**

Estate F. H. Evans, 31-35 Hewes St., Brooklyn, N. Y.

KOVEN & BROTHERS, L. O., 154 Ogden Ave., Jersey City, N. J., *p. 494*

—Domestic Water

Alberger Heater Co., Chicago & Granger Sts., Buffalo, N. Y.

***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y., *p. 140*

Kelley & Son, Benj. F., 25 Church St., New York

Patterson & Co., Frank L., 28 Cortlandt St., New York

Patterson-Kelley Co., 26 Cortlandt St., New York

Richardson & Boynton Co., 31 W. 31st St., New York

Sims Co., Erie, Pa.

***SMITH CO.**, H. B., Westfield, Mass., *p. 478, 479*

Standard Steam Specialty Co., 542 West Broadway, New York

Weld Co., Geo. A., 79 Milk St., Boston, Mass.

Whitlock Coil Pipe Co., Hartford, Conn.

—Feed Water (Closed)

Alberger Heater Co., Chicago & Granger Sts., Buffalo, N. Y.

Alberger Pump & Condenser Co. (Wainwright), 140 Cedar St., New York

Baragwanath & Son, Wm., 1633 Monadnock Block, Chicago, Ill.

Braun & Co., C. F., 503 Market St., San Francisco, Cal.

Brownell Co., Dayton, O.

***CASEY-HEDGES CO.**, Chattanooga, Tenn., *pp. 42, 43*

FROST MFG. CO., 112 W. Adams St., Chicago, Ill., *pp. 47, 462*

***HODGES WATER STILL CO., INC.**, 1234 Callowhill St., Philadelphia, Pa., *p. 500*

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O., *pp. 48, 49, 321*

Jacobs & Co., Charles (Jacobs), 258 Franklin St., Boston, Mass.

KEELER CO., E., Williamsport, Pa., *p. 51*

Kelley & Son, Benj. F., 25 Church St., New York

King Construction Co., N. Tonawanda, N. Y.

KROESCHELL BROS. CO., 400 West Erie St., Chicago, Ill., *p. 56*

Linton Machine Co., 26 Cortlandt St., New York

MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis., *p. 112*

Nason Mfg. Co., 71 Fulton St., New York

Han

*NATIONAL PIPE BENDING CO., New Haven, Conn... *pp. 106, 107*
 Nightingale & Childs Co., 205 Congress St., Boston, Mass.

Ohio Blower Co., Cleveland, O.
 Patterson-Kelley Co., 20 Cortlandt St., New York
 Patterson & Co., Frank L., 28 Cortlandt St., New York

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*
 Reliance Boiler Works, 160 Marion St., Oshkosh, Wis.

Ross Heater & Mfg. Co., Inc., 753 Bird Ave., Buffalo, N. Y.
 SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Sims Co., Erie, Pa.
 Standard Steam Specialty Co. (Utility), 542 West Broadway, New York

Standard Water Systems Co., Hampton, N. J.
 WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J... *p. 116*

Whitlock Coil Pipe Co., Hartford, Conn.
 Williams Tool Co., Erie, Pa.

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York... *pp. 30, 117, 431, 447*

—**Feed Water (Locomotive)**
 Locomotive Feed Water Heater Co., 30 Church St., New York

—**Glue**
 KOVEN & BROTHER, L. O., 154 Odgen Ave., Jersey City, N. J... *p. 494*

Nason Mfg. Co., 71 Fulton St., New York
 PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

—**Juice (Tubular)**
 Murphy Iron Works, John H., New Orleans, La.
 Sims Co., Erie, Pa.

—**Oil**
 Alberger Heater Co., Chicago & Granger Sts., Buffalo, N. Y.

ANTHONY CO., 138 West Ave., Long Island City, N. Y... *p. 410*

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

Lockett & Co., Ltd., A. M., New Orleans, La.

*NATIONAL PIPE BENDING CO., New Haven, Conn... *pp. 106, 107*

Sims Co., Erie, Pa.

—**Rivet (Electric)**
 American Car & Foundry Co., 165 Broadway, New York

HEATERS AND PURIFIERS

—**Feed Water (Open)**
 BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind... *p. 35*

Booth Co., L. M., 62 Hudson St., Jersey City, N. J.

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

Colles Heater & Specialty Co., 14 E. Jackson Blvd., Chicago, Ill.

Cookson Steam Specialty Co., 62 Central Ave., Cincinnati, O.

Elliott Co., Frick Bldg., Pittsburgh, Pa.

FROST MFG. CO., 112 W. Adams St., Chicago, Ill... *pp. 47, 462*

Griscom-Russell Co., 90 West St., New York

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*

Hoppes Mfg. Co., 19 Larch St., Springfield, O.

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

KEELER CO., E. Williamsport, Pa... *p. 51*

Mechanical Scale Prevention Co., 65 Dey St., New York

Michigan Engineering Co., Union Trust Bldg., Detroit, Mich.

MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis... *p. 112*

Moffat Feed Water Heater & Purifier Co., Dayton, O.

*NATIONAL PIPE BENDING CO., New Haven, Conn... *pp. 106, 107*

Open Coil Heater & Purifier Co., Indianapolis, Ind.

PLATT IRON WORKS, Dayton, O... *p. 446*

Power Plant Specialty Co., 1306 Monadnock Bldg., Chicago, Ill.

Ross Mfg. Co., Northville, Mich.

Rummeli-Dawley Mfg. Co. (Ray), 3923 Chouteau Ave., St. Louis, Mo.

Sims Co., Erie, Pa.

WEBSTER & CO., WARREN, Camden, N. J... *pp. 108, 109, 110*

*WICKES BOILER CO., Saginaw, Mich... *p. 66*

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York... *pp. 30, 117, 431, 447*

—**Feed Water (Open and Closed, Combined)**

Moffat Feed Water Heater & Purifier Co., Dayton, O.

—**Feed Water, Metering**

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*

*NATIONAL PIPE BENDING CO., New Haven, Conn... *pp. 106, 107*

WEBSTER & CO., WARREN, Camden, N. J... *pp. 108, 109, 110*

—**HEATERS AND RECEIVERS (Feed Water)**

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*

—**HEATING AND VENTILATING APPARATUS**

AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

American Radiator Co., 816-822 S. Michigan Ave., Chicago, Ill.

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Clarage Fan Co., Kalamazoo, Mich.

Columbus Heating & Ventilating Co., Columbus, O.

Consolidated Engineering Co., 335 W. 28th Place, Chicago, Ill.

Cramer, Stuart W., Charlotte, N. C.

Hart & Cooley Co., New Britain, Conn.

KEELER CO., E. Williamsport, Pa... *p. 51*

Power Efficiency Corp'n, White Bldg., Buffalo, N. Y.

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... *p. 476*

*SMITH CO., H. B., Westfield, Mass... *p. 478*

STERLING BLOWER CO., Hartford, Conn... *p. 436*

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*

UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*

—**HEATING DEVICES, INDUSTRIAL (Electric)**

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*

Simplex Electric Heating Co., Cambridge, Mass.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

—**HEATING MACHINES**

American Gas Furnace Co., 25 John St., New York

—**HEATING SYSTEMS**

STERLING BLOWER CO., Hartford, Conn... *p. 436*

—**Air Return**

Columbus Heating & Ventilating Co., Columbus, O.

Donnelly Systems Co., 9 Murray St., New York

Hea

HEATING SYSTEMS (Continued)**—Air Return**

KEELER CO., E., Williamsport, Pa... *p. 51*
Positive Differential System Co., 9 Murray St., New York

—Exhaust Steam

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*

Tyler Underground Heating System, 815 S. Canal St., N. S., Pittsburgh, Pa.

WEBSTER & CO., WARREN, Camden, N. J... *pp. 108, 109, 110*

UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*

—Gas

General Fire Extinguisher Co., 277 W. Exchange St., Providence, R. I.

—Oil Circulation

PARKS CO., G. M., Fitchburg, Mass... *p. 472*

—Pressure

Bishop & Babcock Co., E. 49th & Hamilton Ave., Cleveland, Ohio.

—Steam

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

Consolidated Engineering Co., 335 W. 28th Place, Chicago, Ill.

KEELER CO., E., Williamsport, Pa... *p. 51*

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... *p. 476*

UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*

WEBSTER & CO., WARREN, Camden, N. J... *pp. 108, 109, 110*

—Vacuum

Bishop & Babcock Co., E. 49th & Hamilton Ave., Cleveland, Ohio

Consolidated Engineering Co., 335 W. 28th Place, Chicago, Ill.

Donnelly Systems Co., 9 Murray St., New York

Dunham Co., C. A., 1710 Fisher Bldg., Chicago, Ill.

Illinois Engineering Co., Racine at 21st St., Chicago, Ill.

KEELER CO., E., Williamsport, Pa... *p. 51*

Positive Differential System Co., 9 Murray St., New York

Richardson & Boynton Co., 31 W. 31st St., New York

Thermograde Valve Co., Howard St., Watertown, Mass.

UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*

Vapor-Vacuum Heating Co., Philadelphia, Pa.

WEBSTER & CO., WARREN, Camden, N. J... *pp. 108, 109, 110*

—Vapor

Bishop & Babcock Co., E. 49th & Hamilton Ave., Cleveland, Ohio

HERRINGBONE GEARS

(See Gears, Herringbone)

HICKORY PRODUCTS

Minton & Son, T. W., Barboursville, Ky.

HINGE MACHINES

Baird Machine Co., Bridgeport, Conn.

HOBBS, THREAD MILLING

Davidson, Tool Mfg. Corp., 120-124 Maiden Lane, New York

Gale-Sawyer Co., 33 Wormwood St., Boston, Mass.

Illinois Tool Works, 154-166 E. Erie St., Chicago, Ill.

HOISTING ENGINES

(See Engines, Hoisting)

HOISTING MACHINERY

Browning & Co., Victor R., 17701 Lake Shore Blvd., Cleveland, O.

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

Erie Hoist Co., 2101 Holland St., Erie, Pa.
Horton Co., John T., 242 Bradhurst Ave., New York

HUNT CO. INC., C. W., West New Brighton, Staten Island, N. Y... *pp. 252, 253*

Lambert Hoisting Engine Co., 115 Poinier St., Newark, N. J.

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

*LINK-BELT CO., 39th St., & Stewart Ave., Chicago, Ill... *p. 256*

Myrick Machine Co., Olean, N. Y.

Potter Mfg. Co., 3511 E. Washington St., Indianapolis, Ind.

Reliance Engineering Co., Lansing, Mich.

ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p. 257*

*SHEPARD ELECTRIC CRANE & HOIST CO., Montour Falls, N. Y... *pp. 274, 275*

Speidel, J. G., Reading, Pa.

WELLMAN-SEAEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

Williams Co., G. H., Erie, Pa.

HOISTING OUTFITS

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

NOVO ENGINE CO., Lansing, Mich... *pp. 444, 445*

HOISTS**—Air**

Bridgeport Engineering Co., Bridgeport, Conn.

COBURN TROLLEY TRACK MFG. CO., Holyoke, Mass... *p. 276*

Curtis Pneumatic Machinery Co., St. Louis, Mo.

Dake Engine Co., Grand Haven, Mich.

Detroit Hoist & Machine Co., Detroit, Mich.

Independent Pneumatic Tool Co., 1307 S. Michigan Ave., Chicago, Ill.

INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

NORDBERG MFG. CO., Milwaukee, Wis... *p. 19*

Northern Engineering Works, Detroit, Mich.

Utility Mfg. Co., Cudahy, Wis.

—Ammunition

FLORY MFG. CO., S., Bangor, Pa... *p. 269*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

—Belt

CHAMBERS BROS. CO., Philadelphia, Pa... *p. 480*

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

FLORY MFG. CO., S., Bangor, Pa... *p. 269*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

Steele & Sons, J. C., Statesville, N. C.

Universal Hoist & Mfg. Co., Cedar Falls, Ia.

—Cargo (Electric)

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

FLORY MFG. CO., S., Bangor, Pa... *p. 269*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

Maine Electric Co., 35 Commercial St., Portland, Me.

Yale & Towne Mfg. Co., 9 E. 40th St., New York

—Chain

Chisholm & Moore Mfg. Co., Lakeside Ave. & E. 49th St., Cleveland, O.

COBURN TROLLEY TRACK MFG. CO., Holyoke, Mass... *p. 276*

*FORD CHAIN BLOCK & MFG. CO., Second & Diamond Sts., Philadelphia, Pa... *p. 278*

Harrington Son & Co., Inc., Edwin, S. W. Cor. 17th & Callowhill Sts., Philadelphia, Pa.

Hobbs Co., Clinton E., 12 Pearl St., Boston, Mass.

Keystone Garage Equipment Co., 204 Devonshire St., Boston, Mass.

*LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*

Hea

Moore Co., Franklin, Winstead, Conn.
 Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Canada

NEW JERSEY FOUNDRY & MACHINE CO., 88 West St., New York... *p. 273*

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... *p. 279*

Northern Crane Works, Ltd., Walkerville, Ont., Canada

Reading Chain & Block Corp'n, Reading, Pa.
 Round & Son, D., Cleveland, O.
 Salisbury Foundry & Machine Co., Salisbury, Md.

Speidel, J. G. (Simplex), Reading, Pa.
 Wright Mfg. Co., Lisbon, O.

—**Chain (Multiple Gear)**

***FORD CHAIN BLOCK & MFG. CO.**, Second & Diamond Sts., Philadelphia, Pa... *p. 278*

Hobbs Co., Clinton E., 12 Pearl St., Boston, Mass.
 Reading Chain & Block Corp'n, Reading, Pa.

—**Coal (Electric)**

***CLYDE IRON WORKS**, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

FLORY MFG. CO., S., Bangor, Pa... *p. 269*

HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y... *p. 252, 253*

***LIDGERWOOD MFG. CO.**, 96 Liberty St., New York... *p. 271*

Maine Electric Co., 35 Commercial St., Portland, Me.

***SHEPARD ELECTRIC CRANE & HOIST CO.**, Montour Falls, N. Y... *p. 274, 275*

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

—**Double Platform**

***CLYDE IRON WORKS**, 29th Ave., W., Michigan St., Duluth, Minn... *p. 268*

***LIDGERWOOD MFG. CO.**, 96 Liberty St., New York... *p. 271*

Patten Mfg. Co., Chattanooga, Tenn.
 Universal Hoist & Mfg. Co., Cedar Falls, Ia.

—**Electric**

ALLIANCE MACHINE CO., Alliance, O... *p. 264*

American Hoist & Derrick Co., St. Paul, Minn.
BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

Bosworth Ard Mach. & Foundry Co., Anniston, Ala.

Box & Co., Alfred, Front & Poplar Sts., Philadelphia, Pa.

***CLYDE IRON WORKS**, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

COBURN TROLLEY TRACK MFG. CO., Holyoke, Mass... *p. 276*

Detroit Hoist & Machine Co., Detroit, Mich.
 Diamond Machine Co., Monongahela, Pa.

Euclid Crane & Hoist Co., Euclid, O.
FLORY MFG. CO., S., Bangor, Pa... *p. 269*

Gillis & Geoghegan, 537 W. Broadway, New York

Granger Co., A. D., 15 Park Row, New York

***HUNT CO., INC.**, C. W., West New Brighton, Staten Island, N. Y... *p. 252, 253*

***LIDGERWOOD MFG. CO.**, 96 Liberty St., New York... *p. 271*

Maine Electric Co., 35 Commercial St., Portland, Me.

Moore Co., Franklin, Winstead, Conn.

NEW JERSEY FOUNDRY & MACHINE CO., 88 West St., New York... *p. 273*

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

NORDBERG MFG. CO., Milwaukee, Wis... *p. 19*

Northern Engineering Works, Detroit, Mich.
 Parker, S. E., 1800 N. Francisco Ave., Chicago, Ill.

Patten Mfg. Co., Chattanooga, Tenn.
 Pawling & Harnischfeger, Milwaukee, Wis.

ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p. 257*

Roeper Crane & Hoist Works, 1729-2745 Moss St., Reading, Pa.

***SHEPARD ELECTRIC CRANE & HOIST CO.**, Montour Falls, N. Y... *p. 274, 275*

Sprague Electric Works, 527 W. 34th St., New York

Stamp & Co., Charles E., Cleveland, O.

Thomas Elevator Co., 22 S. Hoyne Ave., Chicago, Ill.

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

Yale & Towne Mfg. Co., 9 E. 40th St., New York

Young Mfg. Co., R. W., 14 E. Jackson Blvd., Chicago, Ill.

—**Friction Drum**

BLAW-KNOX CO., Pittsburgh, Pa... *p. 489*

Brown Clutch Co., Sandusky, O.

***CALDWELL & SON CO.**, H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*

***CLYDE IRON WORKS**, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

FLORY MFG. CO., S., Bangor, Pa... *p. 269*

International Process Co., 5 Beekman St., New York

***LIDGERWOOD MFG. CO.**, 96 Liberty St., New York... *p. 271*

Milwaukee Shaper & Transmission Appliance Co., 1148-50 Holton St., Milwaukee, Wis.

O. K. Clutch & Machinery Co., Columbia, Pa.
 Patten Mfg. Co., Chattanooga, Tenn.

***POOLE ENGINEERING & MACHINE CO.**, Woodberry Baltimore, Md... *p. 196, 197*

***SHEPARD ELECTRIC CRANE & HOIST CO.**, Montour Falls, N. Y... *p. 274, 275*

Wellington Machine Co., Wellington, O.
WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

—**Gasoline**

Bond Co., Harold L., 383-391 Atlantic Ave., Boston, Mass.

***CLYDE IRON WORKS**, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

FLORY MFG. CO., S., Bangor, Pa... *p. 269*

Gray Aldrich Co., Inc., 33 Commercial Wharf, Boston, Mass.

Ideal Engine Co., Lansing, Mich.

***LIDGERWOOD MFG. CO.**, 96 Liberty St., New York... *p. 271*

Minneapolis Steel & Machinery Co., 29th & Minnehaha Ave., Minneapolis, Minn.

NOVO ENGINE CO., Lansing, Mich... *pp. 444, 445*

Parker, S. E., 1800 N. Francisco Ave., Chicago, Ill.

Patten Mfg. Co., Chattanooga, Tenn.

Universal Hoist & Mfg. Co., Cedar Falls, Ia.

—**Head Gate**

Dilts Machine Works, Inc., Fulton, N. Y.

***HUNT MACHINE CO.**, RODNEY, Orange, Mass... *p. 449*

***LEFFEL & CO.**, JAMES, Springfield, O... *p. 453*

Smith Co., S. Morgan, York, Pa.

Sturgis Machine Co., Sturgis, Mich.

—**Mine**

***CLYDE IRON WORKS**, 29th Ave., W., & Michigan St., Duluth, Minn... *p. 268*

Denver Engineering Works Co., Denver, Colo.

FLORY MFG. CO., S., Bangor, Pa... *p. 269*

Hendrie & Bolthoff Mfg. & Supply Co., 1635 17th St., Denver, Colo.

***LIDGERWOOD MFG. CO.**, 96 Liberty St., New York... *p. 271*

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... *p. 279*

NORDBERG MFG. CO., Milwaukee, Wis... *p. 19*

NOVO ENGINE CO., Lansing, Mich... *pp. 444, 445*

Pneumelectric Machine Co., 581 S. Clinton St., Syracuse, N. Y.

Stine Co., J. C., Tyrone, Pa.

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

—**Skip**

BARTLETT & SNOW CO., C. O., Cleveland O... *p. 249*

Hoi

HOISTS (Continued)

- Skip**
 Beaumont Co., R. H., 450 Chestnut St., Philadelphia, Pa.
 *CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn., p. 268
 *FLORY MFG. CO., S. Bangor, Pa., p. 269
 *HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y., pp. 252, 253
 *LIDGERWOOD MFG. CO., 96 Liberty St., New York, p. 271
 Milholland Co., J. & J. B., 718 Fifth Ave., Pittsburgh, Pa.
 NEWHALL CHAIN FORGE & IRON CO., 90 West Street, New York, p. 279
 Otis Elevator Co., 11th Ave. & 26th St., New York
 ROBINS CONVEYING BELT CO., Park Row Bldg., New York, p. 257
 WELLMAN-SEAEVER-MORGAN CO., 7000 Central Ave., Cleveland, O., p. 272
- Steam**
 (See Engines, Hoisting)
- Truck Body**
 Bay City Foundry & Machine Co., 26th & Water Sts., Bay City, Mich.
 Erie Hoist Co., 2101 Holland St., Erie, Pa.

HOLDERS

- Gas**
 Bartlett Hayward Co., Baltimore, Md.
 Davis & Farnum Mfg. Co., Foundry Ave., Waltham, Mass.
 KOVEN BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J., p. 404
 Riter-Conley Co., Pittsburgh, Pa.
 Western Gas Construction Co., Fort Wayne, Ind.
 WOOD & CO., R. D., Philadelphia, Pa., p. 458

- Knurl**
 Graham Mfg. Co., Providence, R. I.

—Nipple

- Curtis & Curtis Co., 188 Garden St., Bridgeport, Conn.
 Threading Machine Co., Sandusky, O.

—Reamer

- COLBURN MACHINE TOOL CO., Franklin, Pa., pp. 340, 341
 Victor Tool Co. (Sheuman), Waynesboro, Pa.

—Tap and Die (Combination)

- MCCROSKY REAMER CO., Meadville, Pa., pp. 380, 381

—Tool

- AMERICAN TOOL & MACHINE CO., Boston, Mass., p. 400
 Armstrong Bros. Tool Co., 315 N. Francisco Ave., Chicago, Ill.
 CLEVELAND TWIST DRILL CO., Cleveland, O., p. 378
 Gisholt Machine Co., Madison, Wis.
 National Machine Co., 135 Sheldon St., Hartford, Conn.
 Ready Tool Co., Bridgeport, Conn.
 Western Tool & Mfg. Co., Springfield, O.
 WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y., p. 397

—Work (for Machine Tools)

- Boston Scale & Machine Co., 100 Rugges St., Boston, Mass.
- HOLLY GRAVITY RETURN SYSTEMS**
 (See Condensation Return Systems)
- HOOKS, CHAIN**
 NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York, p. 279
 Weiner Chain & Iron Co., Lebanon, Pa.
 WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y., p. 397

HONES

- NORTON CO., Worcester, Mass., p. 391
- HOPPERS**
 *HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y., pp. 252, 253

—Blast Furnace

- MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa., p. 496

—Storage (Cast Iron)

- *GREEN ENGINEERING CO., East Chicago, Ind., pp. 80, 81

—Weighing

- BARTLETT & SNOW CO., C. O., Cleveland, O., p. 249
 HOLMES & BROS., ROBT., Danville, Ill., p. 270
 *HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y., pp. 252, 253
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill., p. 256

AIR HOSE

- *GENERAL ELECTRIC CO., Schenectady, N. Y., pp. 20, 21, 521
 GOODRICH RUBBER CO., B. F., Akron, O., pp. 183, 242
 INGERSOLL-RAND CO., 11 Broadway, New York, pp. 428, 429
 NEW YORK RUBBER CO., 34 Reade St., New York, pp. 244, 245
 Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.
 United Metal Hose Co., Inc., 89 Chambers St., New York
 WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa., pp. 432, 433
- Cotton, Rubber Lined**
 GOODRICH RUBBER CO., B. F., Akron, O., pp. 183, 242
 NEW YORK RUBBER CO., 34 Reade St., New York, pp. 244, 245
 Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.

—Gas

- OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J., p. 241

—Gasoline

- AMERICAN METAL HOSE CO., Waterbury, Conn., p. 184
 United Metal Hose Co., Inc., 89 Chambers St., New York

—High Pressure

- United Metal Hose Co., Inc., 89 Chambers St., New York

—Linen

- ROSSDALE-REDDAWAY BELTING & HOSE CO., Newark, N. J., p. 243

—Metal, Flexible

- AMERICAN METAL HOSE CO., Waterbury, Conn., p. 184
 "Double Service" Packing Co., 246 Chestnut St., Philadelphia, Pa.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York, p. 162
 Kingsbridge Machine Works, Kingsbridge, New York, N. Y.
 Mulconroy Co., Inc., Parkside Station, Philadelphia, Pa.
 Penna. Flexible Metallic Tubing Co., N. E. Cor. Broad & Race Sts., Philadelphia, Pa.
 United Metal Hose Co., Inc., 89 Chambers St., New York
 U. S. Flexible Metallic Tubing Co., Cor. Boyd & Omar Sts., Los Angeles, Cal.

—Oil

- AMERICAN METAL HOSE CO., Waterbury, Conn., p. 184
 GOODRICH RUBBER CO., B. F., Akron, O., pp. 183, 242
 Republic Rubber Corp'n, Youngstown, O.
 United Metal Hose Co., Inc., 89 Chambers St., New York

—Rubber

- Boston Belting Co., 84 Linden Park St., Boston, Mass.
 Boston Woven Hose & Rubber Co., Cambridge, Mass.

Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.

Cincinnati Rubber Mfg. Co., Cincinnati, Ohio
Diamond Rubber Co., Inc., 555 Ellicott Sqr., Buffalo, N. Y.

Empire Rubber & Tire Co., Trenton, N. J.
GOODRICH RUBBER CO., B. F., Akron, O...
pp. 183, 242

Goodyear Tire & Rubber Co., Akron, O.
Goshen Rubber & Mfg. Co., Goshen, Ind.
Gutta Percha & Rubber Mfg. Co., 126-128 Duane St., New York.

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... p. 162

Knowlton Rubber Co., G. W., 60 Pearl St., Boston, Mass.

Maguire Rubber Co., 200 Fifth Ave., New York
Manhattan Rubber Mfg. Co., 61 Willett St., Passaic, N. J.

Mercer Rubber Co., Hamilton Square, N. J.
New York Belting & Packing Co., 91-93 Chambers St., New York.

NEW YORK RUBBER CO., 34 Reade St., New York... pp. 244, 345

Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.

—Steam
AMERICAN METAL HOSE CO., Waterbury, Conn... p. 184

Anchor Packing Co., 7th & Filbert Sts., Philadelphia, Pa.

Continental Rubber Works, Erie, Pa.
GOODRICH RUBBER CO., B. F., Akron, O...
pp. 183, 242

Hamilton Rubber Mfg. Co., Trenton, N. J.
*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... p. 162

N. J. Car Spring & Rubber Co., Jersey City, N. J.
NEW YORK RUBBER CO., 34 Reade St., New York... pp. 244, 245

Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.

—Suction
Edson Mfg. Co., 257 Atlantic Ave., Boston, Mass.
GOODRICH RUBBER CO., B. F., Akron, O...
pp. 183, 242

Hamilton Rubber Mfg. Co., Trenton, N. J.
NEW YORK RUBBER CO., 34 Reade St., New York... pp. 244, 245

Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.

HOSE ATTACHMENTS (Couplings, Bands, Holders, Clamps, etc.)

Blackburn-Smith Corp'n, 105 W. 40th St., New York

Clafin & Co., Chas. A., 161 High St., Boston, Mass.

*GENERAL ELECTRIC CO., Schenectady, N. Y... pp. 20, 21, 521

INGERSOLL-RAND CO., 11 Broadway, New York... pp. 428, 429

ROSSENDALE-REDDAWAY BELTING & HOSE CO., Newark, N. J... p. 243

WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa... pp. 432, 433

HOSE SAND-BLASTS

*PANGBORN CORP'N, P. O. Box 859, Hagerstown, Md... pp. 460, 461

HUMIDIFIERS

AMERICAN BLOWER CO., Detroit, Mich... pp. 434, 435

Bahnson Humidifier Co., Winston-Salem, N. C.
BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... p. 470

Carrier Air Conditioning Co., Buffalo, N. Y.
CARRIER ENGINEERING CORP'N, 39 Cortlandt St., New York... p. 471

Cramer, Stuart W., Charlotte, N. C.
Dicks, Slosson Co., Inc., 302 Broadway, New York

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... p. 494

PARKS CO., G. M., Fitchburg, Mass... p. 472

Richmond Engineering Co., 12 S. 8th St., Richmond, Va.

Seymour, Jr., J. M., 51-53 Lawrence St., Newark, N. J.

Tillotson Humidifier Co., Providence, R. I.

HUMIDITY CONTROL

AMERICAN BLOWER CO., Detroit, Mich... pp. 434, 435

Bahnson Humidifier Co., Winston-Salem, N. C.
BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... p. 470

CARRIER ENGINEERING CORP'N, 39 Cortlandt St., New York... p. 471

Cramer, Stuart W., Charlotte, N. C.

PARKS CO., G. M., Fitchburg, Mass... p. 472

Standard Regulator Co., 282 South St., Newark, N. J.

HYDRANT HEADS, PORTABLE

Ross Valve Mfg. Co., Troy, N. Y.

HYDRANTS, FIRE

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... p. 124

Eddy Valve Co., Waterford, N. Y.

Kennedy Valve Mfg. Co., Elmira, N. Y.

Ludlow Valve Mfg. Co., Troy, N. Y.

Norwood Engineering Co., Florence, Mass.

PRATT & CADY CO., INC., Hartford, Conn... pp. 134, 135

Rennselaer Valve Co., Troy, N. Y.

Smith Mfg. Co., A. P., East Orange, N. J.

WOOD & CO., R. D., Philadelphia, Pa... p. 458

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York... 30, 117, 431, 447

HYDRATING PLANTS

BURROUGHS CO., CHARLES, Newark, N. J... p. 454

*HUNT MACHINE CO., RODNEY, Orange, Mass... p. 449

Stacey-Schmidt Mfg. Co., 230 E. Hay St., York, Pa.

HYDRAULIC JACKS, RAMS, TURBINES, ETC.

(See Jacks, Rams, Turbines, etc., Hydraulic)

HYDRAULIC MACHINERY

ALLIANCE MACHINE CO., Alliance, O... p. 264

Birmingham Iron Foundry, Derby, Conn.

BURROUGHS CO., CHARLES, Newark, N. J... p. 454

Farquhar Co., Ltd., A. B., York, Pa.

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis... p. 455

General Briquetting Co., 25 Broad St., New York

Hennebelle Co., F., 81st St., & S. Chicago Ave., S. Chicago, Ill.

Lake Erie Engineering Works, Buffalo, N. Y.

Logemann Bros. Co., 3120 Burleigh St., Milwaukee, Wis.

Lourie Mfg. Co., Springfield, Ill.

NILES-BEMENT-POND CO., 111 Broadway, New York... p. 344

Ridgway & Son Co., Craig, Coatesville, Pa.

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... p. 456

Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

WATSON-STILLMAN CO., 35 Church St., New York... p. 457

Wood, William H., Media, Pa.

WOOD & CO., R. D., Philadelphia, Pa... p. 458

HYDROGEN GAS

Burdett Mfg. Co., 309 St. Johns Court, Chicago, Ill.

International Oxygen Co., 115 Broadway, New York

HYDROMETERS

Berg Mfg. Co., James, 3707 12th Ave., Brooklyn, N. Y.

*FOXBORO CO., INC., Foxboro, Mass... p. 533

Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia, Pa.

HYDROMETERS (Continued)

REPUBLIC FLOW METERS CO., 565 W. Washington Blvd., Chicago, Ill., p. 522
 TAYLOR INSTRUMENT COS., Rochester, N. Y., p. 536
 Wagner, Carl H., 1944 W. Albany Ave., Chicago, Ill.

HYGROMETERS

BROWN INSTRUMENT CO., Philadelphia, Pa., p. 531
 *FOXBORO CO., INC., Foxboro, Mass., p. 533
 TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y., p. 535
 TAYLOR INSTRUMENT COS., Rochester, N. Y., p. 536

I**I-BEAM TROLLEYS**

(See Trolleys, Mono-Rail)

ICE HANDLING MACHINERY

*CALDWELL & SON CO., H. W., 17th St., & Western Ave., Chicago, Ill., p. 250
 Gifford-Wood Co., Hudson, N. Y.
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill., p. 256

ICE MAKING MACHINERY

Arctic Ice Machine Co., Canton, O.
 Armstrong Machinery Co., 3201-3219 E. Riverside, Spokane, Wash.
 AUTOMATIC REFRIGERATING CO., Hartford, Conn., p. 477
 Baker Ice Machine Co., Omaha, Neb.
 Brunswick Refrigerating Co., New Brunswick, N. J.
 Buffalo Refrigerating Machine Co., 126 Liberty St., New York
 Carbondale Machine Co., Carbondale, Pa.
 *CASEY HEDGES CO., Chattanooga, Tenn., p. 42, 43
 Castle Refrigerating Machine Co., Indianapolis, Ind.
 Cloth Co., 61 Broadway, New York
 Columbus Iron Works Co., Columbus, Ga.
 *DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York, p. 28
 Frick Co., Waynesboro, Pa.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York, p. 162
 KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill., p. 56
 Mayer Ice Machine & Engineering Co., Morris St. & Hudson River, Jersey City, N. J.
 Niebling Co., F. W., Norwood, Cincinnati, O.
 Pennsylvania Engineering Co., 1119-21 N. Howard St., Philadelphia, Pa.
 Phoenix Ice Machine Co., 2711 Church Ave., Cleveland, O.
 Remington Machine Co., Wilmington, Del.
 Roekler, H. B., 41 Maiden Lane, New York
 Ruemmel-Dawley Mfg. Co., Chouteau Ave., St. Louis, Mo.
 Triumph Electric Co., Oakley, Cincinnati, O.
 Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis., p. 18
 Vogt Brothers Mfg. Co., 1402 W. Main St., Louisville, Ky.
 VOGT MACHINE CO., HENRY, Louisville, Ky., p. 63
 Vulcan Iron Works, 1849 Kearny St., San Francisco, Cal.
 Wegner Machine Co., Perry & Mississippi Sts., Buffalo, N. Y.
 York Mfg. Co., York, Pa.

Hyd Carbondale Machine Co., Carbondale, Pa.
 *CASEY HEDGES CO., Chattanooga, Tenn., p. 42, 43

Castle Refrigerating Machine Co., Indianapolis, Ind.
 Cloth Co., 61 Broadway, New York
 Columbus Iron Works Co., Columbus, Ga.
 *DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York, p. 28
 Frick Co., Waynesboro, Pa.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York, p. 162
 KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill., p. 56
 Mayer Ice Machine & Engineering Co., Morris St. & Hudson River, Jersey City, N. J.
 Niebling Co., F. W., Norwood, Cincinnati, O.
 Pennsylvania Engineering Co., 1119-21 N. Howard St., Philadelphia, Pa.
 Phoenix Ice Machine Co., 2711 Church Ave., Cleveland, O.
 Remington Machine Co., Wilmington, Del.
 Roekler, H. B., 41 Maiden Lane, New York
 Ruemmel-Dawley Mfg. Co., Chouteau Ave., St. Louis, Mo.
 Triumph Electric Co., Oakley, Cincinnati, O.
 Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis., p. 18
 Vogt Brothers Mfg. Co., 1402 W. Main St., Louisville, Ky.
 VOGT MACHINE CO., HENRY, Louisville, Ky., p. 63
 Vulcan Iron Works, 1849 Kearny St., San Francisco, Cal.
 Wegner Machine Co., Perry & Mississippi Sts., Buffalo, N. Y.
 York Mfg. Co., York, Pa.

Castle Refrigerating Machine Co., Indianapolis, Ind.
 Cloth Co., 61 Broadway, New York
 Columbus Iron Works Co., Columbus, Ga.
 *DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York, p. 28
 Frick Co., Waynesboro, Pa.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York, p. 162
 KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill., p. 56
 Mayer Ice Machine & Engineering Co., Morris St. & Hudson River, Jersey City, N. J.
 Niebling Co., F. W., Norwood, Cincinnati, O.
 Pennsylvania Engineering Co., 1119-21 N. Howard St., Philadelphia, Pa.
 Phoenix Ice Machine Co., 2711 Church Ave., Cleveland, O.
 Remington Machine Co., Wilmington, Del.
 Roekler, H. B., 41 Maiden Lane, New York
 Ruemmel-Dawley Mfg. Co., Chouteau Ave., St. Louis, Mo.
 Triumph Electric Co., Oakley, Cincinnati, O.
 Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis., p. 18
 Vogt Brothers Mfg. Co., 1402 W. Main St., Louisville, Ky.
 VOGT MACHINE CO., HENRY, Louisville, Ky., p. 63
 Vulcan Iron Works, 1849 Kearny St., San Francisco, Cal.
 Wegner Machine Co., Perry & Mississippi Sts., Buffalo, N. Y.
 York Mfg. Co., York, Pa.

Castle Refrigerating Machine Co., Indianapolis, Ind.
 Cloth Co., 61 Broadway, New York
 Columbus Iron Works Co., Columbus, Ga.
 *DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York, p. 28
 Frick Co., Waynesboro, Pa.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York, p. 162
 KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill., p. 56
 Mayer Ice Machine & Engineering Co., Morris St. & Hudson River, Jersey City, N. J.
 Niebling Co., F. W., Norwood, Cincinnati, O.
 Pennsylvania Engineering Co., 1119-21 N. Howard St., Philadelphia, Pa.
 Phoenix Ice Machine Co., 2711 Church Ave., Cleveland, O.
 Remington Machine Co., Wilmington, Del.
 Roekler, H. B., 41 Maiden Lane, New York
 Ruemmel-Dawley Mfg. Co., Chouteau Ave., St. Louis, Mo.
 Triumph Electric Co., Oakley, Cincinnati, O.
 Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis., p. 18
 Vogt Brothers Mfg. Co., 1402 W. Main St., Louisville, Ky.
 VOGT MACHINE CO., HENRY, Louisville, Ky., p. 63
 Vulcan Iron Works, 1849 Kearny St., San Francisco, Cal.
 Wegner Machine Co., Perry & Mississippi Sts., Buffalo, N. Y.
 York Mfg. Co., York, Pa.

ICE PLANT SUPPLIES

Decarie Incinerator Co., 817 McKnight Bldg., Minneapolis, Minn.
 *DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York, p. 28

Niebling Co., F. W., Norwood, Cincinnati, O.
 Ruemmel-Dawley Mfg. Co., 3900 Chouteau Ave., St. Louis, Mo.

*VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis., p. 18

VOGT MACHINE CO., HENRY, Louisville, Ky., p. 63

WASHBURN & GRANGER, 50 Church St., New York, p. 91

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., pp. 114, 115

IGNITION APPARATUS

Wells Mfg. Co., R. C., Fond du Lac, Wis.
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., pp. 114, 115

Witherbee Igniter Co., 132 Liberty St., Springfield, Mass.

IMPREGNATING APPARATUS

Devine Co., J. P., 1372 Clinton St., Buffalo, N. Y.

INCINERATORS

JARVIS ENGINEERING CO., 261 Franklin St., Boston, Mass., p. 502

INDICATOR FITTINGS AND SUPPLIES

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass., p. 527

INDICATOR POSTS

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill., pp. 120, 121, 122, 123

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa., p. 124

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa., pp. 132, 133

PRATT & CADY CO., INC., Hartford, Conn., pp. 134, 135

WOOD & CO., R. D., Philadelphia, Pa., p. 458

INDICATORS**—Air Speed**

*FOXBORO CO., INC., Foxboro, Mass., p. 533

*PRECISION INSTRUMENT CO., Detroit, Mich., p. 524

—CO₂

Bacharach Industrial Instrument Co., 422 First Ave., Pittsburgh, Pa.

*FOXBORO CO., INC., Foxboro, Mass., p. 533

Harger Co., F. D., 325 Ellicott Square, Buffalo, N. Y.

*PRECISION INSTRUMENT CO., Detroit, Mich., p. 524

UEHLING INSTRUMENT CO., 2011 Empire Bldg., New York, p. 525

—Engine (Continuous Card)

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass., p. 527

Robertson & Sons, Jas. L., 80 Murray St., New York

—Engine (Inside and Outside Spring)

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass., pp. 142, 143

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass., p. 527

Thompson & Co., Richard, 126 Liberty St., New York

Trill Indicator Co., Center St., Corry, Pa.

—Sight Flow

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis., pp. 170, 171

—Smoke

Boiler Room Improvement Co. (Eclipse), 8 S. Dearborn St., Chicago, Ill.

Hamler Eddy Smoke Recorder Co., 3906 S. Halsted St., Chicago, Ill.

*PRECISION INSTRUMENT CO., Detroit, Mich., p. 524

—Speed

ATKINS & CO., INC., E. C., Indianapolis, Ind., p. 385

Brown Instrument Co., Philadelphia, Pa., p. 531

Electric Tachometer Co., 710-11 Otis Bldg., Philadelphia, Pa.

***FOXBORO CO., INC.**, Foxboro, Mass...*p.* 533

***GREENE-TWEED & CO.**, 109 Duane St., New York...*p.* 168

UEHLING INSTRUMENT CO., 2011 Empire Bldg., New York...*p.* 525

—Thread

MODERN TOOL CO., Erie, Pa...*pp.* 360, 361

—Time Firing

HAYS CORP'N, JOS. W., Michigan City, Ind...*p.* 523

INDUSTRIAL RAILWAYS

(See Railways, Industrial)

INJECTORS

AMERICAN INJECTOR CO., Detroit, Mich...*p.* 151

***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp.* 120, 121, 122, 123

Desmond-Stephan Mfg. Co., Urbana, O.
Eynon-Evans Mfg. Co., 15th & Clearfield Sts., Philadelphia, Pa.

Godfrey, Keeler Co., 70 Warren St., New York
Hancock Inspirator Co., 119 W. 40th St., New York

Hayden & Derby Mfg. Co., 119 W. 40th St., New York

***JENKINS BROS.**, 80 White St., New York...*pp.* 128, 129

Manning, Maxwell & Moore, Inc., 119 W. 40th St., New York

Nathan Mfg. Co., Lawrence & Amity Sts., Flushing, Long Island, N. Y.

Ohio Injector Co., S. Main St., Wadsworth, O.

PENBERTHY INJECTOR CO., Detroit, Mich...*pp.* 152, 153

Randle Machinery Co. (Leader), Cincinnati, O.
Rue Mfg. Co., 228 Cherry St., Philadelphia, Pa.

Sellers & Co., Inc., Wm., Philadelphia, Pa.
Sherwood Mfg. Co., 1702-1712 Elmwood Ave., Buffalo, N. Y.

Watson, N. A., 2016 State St., Erie, Pa.

INSTRUMENTS

—Electrical Measuring

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa...*p.* 539

BROWN INSTRUMENT CO., Philadelphia, Pa...*p.* 531

Crandon Mfg. Co., Fore & Cross Sts., Portland, Me.

***GENERAL ELECTRIC CO.**, Schenectady, N. Y...*pp.* 20, 21, 521

Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio

Jewell Electrical Instrument Co., 1650 Walnut St., Chicago, Ill.

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

Morse Thermo Gage Co., Ithaca, N. Y.

Pignolet, Louis M., 78 Cortlandt St., New York

Price Electric Co., 12369 Euclid Ave., Cleveland, O.

Pyroelectric Instrument Co., 148 E. State St., Trenton, N. J.

REPUBLIC FLOW METERS CO., 565 W. Washington Blvd., Chicago, Ill...*p.* 522

Robert Instrument Co., 56 Shelby St., Detroit, Mich.

Roller-Smith Co., 233 Broadway, New York

TAYLOR INSTRUMENT COS., Rochester, N. Y...*p.* 536

Thompson-Levering Co., 325 Arch St., Philadelphia, Pa.

***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa...*pp.* 114, 115

***WESTERN ELECTRICAL INSTRUMENT CO.**, 49 Weston Ave., Waverly Park, Newark, N. J...*p.* 537

—Hardness Measuring

Holz, Herman A., 1 Madison Ave., New York

Scientific Materials Co., Pittsburgh, Pa.

Shore Instrument & Mfg. Co., 555 W. 22nd St., New York

Pittsburgh Instrument & Machine Co., 101 Water St., Pittsburgh, Pa.

—Precision Measuring

Coats Machine Tool Co., Inc., 30 Church St., New York

Meyers, C. W. F., Bedford, Ind.

***NORMA CO. OF AMERICA**, 1790 Broadway, New York...*p.* 226

White Dental Mfg. Co., S. S., 211 S. 12th St., Philadelphia, Pa.

—Recording

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass...*pp.* 142, 143

***BAILEY METER CO.**, 141 Milk St., Boston, Mass...*p.* 519

BRISTOL CO., Waterbury, Conn...*p.* 530

BROWN INSTRUMENT CO., Philadelphia, Pa...*p.* 531

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass...*p.* 527

Defender Automatic Regulator Co., 506 Oriol Bldg., St. Louis, Mo.

DuVivier, Ernest H., 30 Church St., New York

ENGELHARD, CHARLES, 30 Church St., New York...*p.* 532

***FOXBORO CO., INC.**, Foxboro, Mass...*p.* 533

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa...*pp.* 104, 105

HAYS CORP'N, Jos. W., Michigan City, Ind...*p.* 523

Hydro Mfg. Co., 320 Bullitt Bldg., Philadelphia, Pa.

***PRECISION INSTRUMENT CO.**, Detroit, Mich...*p.* 524

REPUBLIC FLOW METERS CO., 565 W. Washington Blvd., Chicago, Ill...*p.* 522

TAYLOR INSTRUMENT COS., Rochester, N. Y...*p.* 536

UEHLING INSTRUMENT CO., 2011 Empire Bldg., New York...*p.* 525

***WESTINGHOUSE ELECTRIC MFG. & CO.**, East Pittsburgh, Pa...*pp.* 114, 115

Wilson-Macaulen Co., 781 E. 142nd St., New York

—Scientific

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa...*p.* 539

BROWN INSTRUMENT CO., Philadelphia, Pa...*p.* 531

Central Scientific Co., 460 E. Ohio St., Chicago, Ill.

Custer Specialty Co., 26-28 N. Ludlow St., Dayton, O.

ENGELHARD, CHARLES, 30 Church St., New York...*p.* 532

***GENERAL ELECTRIC CO.**, Schenectady, N. Y...*pp.* 20, 21, 521

Green, Henry J., 1191 Bedford Ave., Brooklyn, N. Y.

Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia, Pa.

Queen-Gray Co., 616-620 Chestnut St., Philadelphia, Pa.

Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn, N. Y.

Standard Scientific Co., 70 Fifth Ave., New York

TAYLOR INSTRUMENT COS., Rochester, N. Y...*p.* 536

INSULATING MACHINERY

American Insulating Machinery Co., Inc., Fairhill & Huntington Sts., Philadelphia, Pa.

***GENERAL ELECTRIC CO.**, Schenectady, N. Y...*pp.* 20, 21, 521

NEW ENGLAND BUTT CO., Providence, R. I...*p.* 484

New England Wire Machinery Co., New Haven, Conn.

Royle & Sons, John, Paterson, N. J.

TEXTILE MACHINE WORKS, Reading, Pa...*p.* 485

TORRINGTON MFG. CO., Torrington, Conn...*p.* 483

Ins

INSULATING MATERIALS**—Electric****AMERICAN VULCANIZED FIBRE CO.**Wilmington, Del. . . *p.* 296**Consumers Rubber Co.**, 829 Superior Ave., Cleveland, O.***CONTINENTAL FIBRE CO.**, Newark, Del. . . *p.* 297**D & W FUSE CO.**, Providence, R. I. . . *p.* 393***DIAMOND STATE FIBRE CO.**, Bridgeport, Pa. . . *p.* 298***GENERAL ELECTRIC CO.**, Schenectady, N. Y. . . *pp.* 20, 21, 521**GOODRICH RUBBER CO.**, B. F., Akron, O. . . *pp.* 183, 242***JOHNS-MANVILLE CO.**, H. W., 296 Madison Ave., New York. . . *p.* 162**Johns-Pratt Co.**, 555 Capitol Ave., Hartford, Conn.**Sterling Varnish Co.**, 528 Fulton Bldg., Pittsburgh, Pa.**United States Asbestos Co.**, Fehl Bldg., Lancaster, Pa.**Vincent-Gilson Engineering Co.**, 30 Church St., New York***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa. . . *pp.* 114, 115**—Heat and Cold****American Balsa Corp'n**, 50 E. 42nd St., New York**Armstrong Cork & Insulation Co.**, Pittsburgh, Pa.**Booth Felt Co., Inc.**, 440-450 14th St., Brooklyn, N. Y.**CÉLITE PRODUCTS CO.**, 11 Broadway, New York. . . *p.* 98**EHRET MAGNESIA MFG. CO.**, Valley Forge, Pa. . . *pp.* 164, 165**Fibre Cell Asbestos Mfg. Co.**, 407-409 S. Clinton St., Chicago, Ill.***JOHNS-MANVILLE CO.**, H. W., 296 Madison Ave., New York. . . *p.* 162**KEASBEY & MATTISON CO.**, Ambler, Pa. . . *pp.* 164, 165***MAGNESIA ASSOCIATION OF AMERICA**, 721 Bulletin Bldg., Philadelphia, Pa. . . *pp.* 164, 165**National Air Cell Covering Co.**, 163-193 Henderon St., Jersey City, N. J.**Nightingale & Childs Co.**, 205 Congress St., Boston, Mass.**Ric-Wil Co.**, 522 Guardian Bldg., Cleveland, O.**Standard Asbestos Mfg. Co.**, Chicago, Ill.**Union Fibre Co.**, Winona, Minn.**United States Mineral Wool Co.**, 280 Madison Ave., New York**J****IRON****—Pig****Bethlehem Steel Co.**, South Bethlehem, Pa.**—Staybolt****Falls Hollow Staybolt Co.**, 21 E. Portage St., Cuyahoga Falls, O.**Lockhart Iron & Steel Co.**, Pittsburgh, Pa.**Rome Iron Mills, Inc.**, 30 Church St., New York**Sligo Iron & Steel Co.**, Connellsville, Pa.**IRON WORK, ORNAMENTAL**

(See Ornamental Work)

IRRIGATION MACHINERY**Castle Engineering Co., Inc.**, A. M., LaCrosse, Wis.**Charter Gas Engine Co.**, Sterling, Ill.**Oliver Mfg. Co.**, Fourth & Madison Sts., Oakland, Cal.**JACKS****—Car****DeWeese Co.**, F. M. (Mosher), Chillicothe, O.**—Hydraulic****Dienelt & Eisenhardt, Inc.**, 1304 N. Howard St., Philadelphia, Pa.**Duff Mfg. Co.**, Pittsburgh, Pa.**Henderer's Sons**, A. L., Wilmington, Del.**Joyce-Gridland Co.**, Dayton, O.**Justice & Co.**, P. S. (Reliance), 421 Chestnut St., Philadelphia, Pa.**Stickney Co.**, Charles A., St. Paul, Minn.**WATSON-STILLMAN CO.**, 35 Church St., New York. . . *p.* 457**WOOD & CO.**, R. D., Philadelphia, Pa. . . *p.* 458**—Lifting****Air Device Mfg. Co.**, 2977 Cottage Grove Ave., Chicago, Ill.**Buda Co.**, Railway Exchange Bldg., Chicago, Ill.**DeWeese Co.**, F. M. (Mosher), Chillicothe, O.**Duff Mfg. Co.**, Pittsburgh, Pa.**Iron City Products Co.**, Pittsburgh, Pa.**Joyce-Gridland Co.**, Dayton, O.**McKiernan-Terry Drill Co.**, 15 Park Row, New York**—Pumping (Oil Well)****Myrick Machine Co.**, Olean, N. Y.**—Screw****Clayville Foundry & Machine Co., Inc.**, Clayville, N. Y.**Justice & Co.**, P. S., 421 Chestnut St., Philadelphia, Pa.**RIEHLÉ BROS. TESTING MACHINE CO.**, 1424 N. 9th St., Philadelphia, Pa. . . *p.* 512**—Track****DeWeese Co.**, F. M. (Mosher), Chillicothe, O.**JACQUARD-CARD MACHINES****Royle & Sons**, John, Paterson, N. J.**JAPANNING****Pickling Enameling Corp'n**, Second at Webster Aves., Long Island City, N. Y.**JARRING MACHINES****Herman Pneumatic Machine Co.**, Pittsburgh, Pa.**JAWS, FACE PLATE (Portable)****Horton & Son Co.**, E., Windsor Locks, Conn.**JIGS AND FIXTURES****AKRON METALLIC GASKET CO.**, 152 N. Union St., Akron, O. . . *p.* 177**Bradley Mach. Co.**, Bridgeport, Conn.**City Machine & Tool Works**, Dayton, Ohio**Columbus Die, Tool & Machine Co.**, Columbus, O.**Diamant Tool & Mfg. Co.**, 164 Emmett St., Newark, N. J.**Dodge Tool Co.**, Grinnell, Ia.**Easton Machine Co.**, Washington St., South Easton, Mass.**Electric Co.**, 94 Allyn St., Hartford, Conn.**Goddard Tool Co.**, 351 W. Chicago Ave., Chicago, Ill.**Hall Gas Engine Co.**, Brioresburg, Philadelphia, Pa.**Harris Engrg. Co.**, H. E., 1047 Broad St., Bridgeport, Conn.**Hartford Engine Works**, 223 State St., Hartford, Conn.**Hartford Special Machinery Co.**, Hartford, Conn.**Hinsman Machine & Tool Co.**, Elm St., Westfield, Mass.**Holmes Mfg. Co.**, Shelton, Conn.**Keller Pneumatic Tool Co.**, Grand Haven, Mich.**Lincoln Machine Co.**, Maine & Carver Sts., Pawtucket, R. I.**Mantle & Co.**, 1907 Park Ave., New York**Matthews Engineering Co.**, Sandusky, O.**Maute & Sons, J.**, 23 Kane St., Buffalo, N. Y.**MEHL MACHINE TOOL & DIE CO.**, Roselle, N. J. . . *pp.* 376, 377**Meyers Co.**, W. F., Bedford, Ind.**Modern Mfg. Co.**, 75 Third St., Bridgeport, Conn.**Moran Flexible Steam Joint Co., Inc. (Moran)**, 217-22 Main St., Louisville, Ky.**Reynolds Machine Co.**, N. West St., Massillon, O.**Robbins, Gamwell & Co.**, Pittsfield, Mass.*Advertisements of firms marked * appear in The Journal, A. S. M. E.*

Rogers Machine Co., 25 Church St., New York
 Sheffield Machine & Tool Co., Dayton, O.
 SLOAN & CHASE MFG. CO., LTD., Sixth
 Ave., Cor N. 13th St., Newark, N. J. . . p. 357
 Spafford Tool Works, 10 Hoadley Place, Hart-
 ford, Conn.
 Ulmer Co., J. C., 1791 E. 38th St., Cleveland,
 O.
 Union Gear & Machine Co., 27 Purchase St.,
 Boston, Mass.
 Urbana Tool and Die Co., Urbana, O.
 Walker Bros. Co., 227 Walton St., Syracuse,
 N. Y.

JOINTS**—Ball and Swing**

*AMERICAN DISTRICT STEAM CO., North
 Tonawanda, N. Y. . . p. 140

—Expansion

*AMERICAN DISTRICT STEAM CO., North
 Tonawanda, N. Y. . . p. 140
 BADGER & SONS CO., E. B., Boston, Mass. . .
 p. 159

Central Station Steam Co., 710 E. Woodbridge
 St., Detroit, Mich.

*CRANE CO., 836 S. Michigan Ave., Chicago,
 Ill. . . pp. 120, 121, 122, 123

Direct Separator Co., Syracuse, N. Y.
 Hornung, J. C., 343 S. Dearborn St., Chicago,
 Ill.

Howard Iron Works, 285 Chicago St., Buffalo,
 N. Y.

Konold Co., M. J., 602 Bessemer Bldg., Pitts-
 burgh, Pa.

NUTTALL CO., R. D., Pittsburgh, Pa. . . p.
 195

*PITTSBURGH VALVE, FOUNDRY &
 CONST. CO., Pittsburgh, Pa. . . pp. 132, 133
 Ross Heater & Mfg. Co., Inc., 753 Bird Ave.,
 Buffalo, N. Y.

SIMMONS CO., JOHN, 110 Center St., New
 York. . . p. 515

Tyler Underground Heating System, 815 S.
 Canal St., N. S., Pittsburgh, Pa.

—Flanged Pipe

*AMERICAN DISTRICT STEAM CO., North
 Tonawanda, N. Y. . . p. 140

Ballwood Co., 30 Church St., New York

*CRANE CO., 836 S. Michigan Ave., Chicago,
 Ill. . . pp. 120, 121, 122, 123

Mitchell & Co., Inc., W. K., 2040 Ellsworth St.,
 Philadelphia, Pa.

*PITTSBURGH VALVE, FOUNDRY &
 CONST. CO., Pittsburgh, Pa. . . pp. 132, 133
 SIMMONS CO., JOHN, 110 Center St., New
 York. . . p. 515

Simmons Pipe Bending Works, 41 Mechanic St.,
 Newark, N. J.

—Flexible

*AMERICAN DISTRICT STEAM CO., North
 Tonawanda, N. Y. . . p. 140

Barco Brass & Joint Co., 212 W. Illinois St.,
 Chicago, Ill.

Walker Mfg. Co., Fenton, Mich.

WILLIAMS, INC., FRANKLIN (Tuxeda), 41
 Cortlandt St., New York. . . p. 161

—Rail

Rail Joint Co., 61 Broadway, New York

—Swing and Swivel

Barco Brass & Joint Co., 212 W. Illinois St.,
 Chicago, Ill.

*PITTSBURGH VALVE, FOUNDRY &
 CONST. CO., Pittsburgh, Pa. . . pp. 132, 133

Universal Valve Co., Burlington, Wis.

WILLIAMS, INC., FRANKLIN (Tuxeda), 41
 Cortlandt St., New York. . . p. 161

—Universal

Bearings Co. of America, Lancaster, Pa.

Burt Mfg. Co., Kalamazoo, Mich.

Spicer Mfg. Corp'n, South Plainfield, N. J.

JOLT RAMMING MACHINES

(See Rammers, Foundry)

JOURNAL BOXES

CALDWELL CO., INC., W. E., 340 E. Brandeis
 St., Louisville, Ky. . . p. 201

McCord & Co., Chicago, Ill.

National Malleable Castings Co., 7706 Platt
 Ave., Cleveland, O.

Symington Co., T. H., 30 Church St., New York
 UNION SPRING & MFG. CO. (Kensington),
 1207 Fulton Bldg., Pittsburgh, Pa. . . p. 424

KEROSENE

TIDE WATER OIL CO., 11 Broadway, New
 York. . . p. 176

K**KETTLES****—Agitating**

Carthage Machine Co., Carthage, N. Y.

—Glass Enameled Steel

PFAUDLER CO., Rochester, N. Y. . . p. 499

—Steam-Jacketed

ALUMINUM CO. OF AMERICA, Pittsburgh,
 Pa. . . p. 294

BADGER & SONS CO., E. B., Boston, Mass.
 . . . p. 159

Buckeye Boiler Co., 1617 McLain St., Dayton,
 O.

*CASEY-HEDGES CO., Chattanooga, Tenn. . .
 pp. 42, 43

COLE MFG. CO., R. D., Newnan, Ga. . . p. 41

KEELER CO., E., Williamsport, Pa. . . p. 51

KOVEN & BROTHER, L. O., 154 Ogden Ave.,
 Jersey City, N. J. . . p. 494

MORRISON BROS., Dubuque, Ia. . . p. 495

MURRAY IRON WORKS CO., Burlington,
 Ia. . . pp. 54, 55

PFAUDLER CO., Rochester, N. Y. . . p. 499

PHOENIX IRON WORKS CO., Meadville,
 Pa. . . p. 497

Sowers Mfg. Co., 1300 Niagara St., Buffalo,
 N. Y.

—Tar

Connerly & Co., Inc., 2nd & Luzerne Sts., Phila-
 delphia, Pa.

Estate F. H. Evans, 31-35 Hewes St., Brooklyn,
 N. Y.

Honhorst Co., Jos., 1016-20 N. 6th St., Cin-
 cinnati, O.

KOVEN & BROTHER, L. O., 154 Ogden Ave.,
 Jersey City, N. J. . . p. 494

MARSHALL FOUNDRY CO., 1st Natl. Bank
 Bldg., Pittsburgh, Pa. . . p. 496

—Varnish (Welded)

ALUMINUM CO. OF AMERICA, Pittsburgh,
 Pa. . . p. 294

American Welding Co., Carbondale, Pa.

KOVEN & BROTHER, L. O., 154 Ogden Ave.,
 Jersey City, N. J. . . p. 494

PFAUDLER CO., Rochester, N. Y. . . p. 499

KEYS, MACHINE

Columbia Nut & Bolt Co., Inc. (Simplicity),
 Bridgeport, Conn.

Dyett Co., Frank J., 73 John St., Ilion, N. Y.

Latshaw Steel & Metal Products Corp'n, Spring
 City, Pa.

Leard Co., Wm. E., 16th St. & 5th Ave., New
 York

Moltrup Steel Products Co., Beaver Falls, Pa.

Morton Mfg. Co., Muskegon Heights, Mich.

Standard Gauge Steel Co., Beaver Falls, Pa.

WHITNEY MFG. CO., Hartford, Conn. . . p.
 367

WILLIAMS & CO., J. H., 70 Richards St.,
 Brooklyn, N. Y. . . p. 397

KEYSEATING MACHINES

Baker Brothers, Toledo, O.

Chattanooga Machinery Co., N. Chattanooga,
 Tenn.

Davis Machine Tool Co., Inc., 305 St. Paul St.,
 Rochester, N. Y.

Lapointe Co., J. N., New London, Conn.

LAPOINTE MACHINE TOOL CO., Hudson,
 Mass. . . p. 351

Mitts & Merrill, 816 S. Franklin St., Saginaw,
 Mich.

Key

KEYSEATING MACHINES (Continued)

Morton Mfg. Co., Muskegon Heights, Mich.
National Machine Tool Co., 2272 Spring Grove Ave., Cincinnati, O.

WHITNEY MFG. CO., Hartford, Conn... *p.* 367

KIERS, BLEACH (Rotary)

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp.* 44, 45

KOVEN & BROTHER L. O., 154 Ogden Ave., Jersey City, N. J... *p.* 494

Smith & Son Co., Samuel, 130-150 Railroad Ave., Paterson, N. J.

KILNS**—Cement**

BONNOT CO., Canton, O... *p.* 464

*FULLER-LEHIGH CO., Fullerton, Pa... *p.* 92
Sterrit-Thomas Foundry Co., 32nd & Smallman Sts., Pittsburgh, Pa.

—Dry (Brick, Lumber, Stone, Etc.)

Adkins, Young & Allen Co., 561 W. Washington Blvd., Chicago, Ill.

AMERICAN BLOWER CO., Detroit, Mich... *pp.* 434, 435

Grand Rapids Veneer Works, Grand Rapids, Michigan

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp.* 74, 75

—Lime

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp.* 42, 43

*FULLER-LEHIGH CO., Fullerton, Pa... *p.* 92
Schaffer Engineering & Equipment Co., Tiffin, O.

Stacy-Schmidt Mfg. Co., 230 E. Hay St., York, Pa.

—Revivifying**KNIFE SHARPENING MACHINES**

Wardwell Mfg. Co., 110-112 Hamilton Ave., Cleveland, O.

Key KNIVES**—Belt**

ATKINS & CO., INC., E. C., Indianapolis, Ind... *p.* 385

—Circular

HUTHER BROS SAW MFG. CO., Rochester, N. Y... *p.* 386

—Cutting (Cloth, Leather, Etc.)

Hyde Mfg. Co., Southbridge, Mass.

—Machine

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p.* 490

Dilts Machine Works, Inc., Fulton, N. Y.
Lancaster Machine & Knife Works, Lancaster, N. Y.

Simonds Mfg. Co., Fitchburg, Mass.

—Shear

Tinker & Sons Co., F., Pittsburgh, Pa.

—Squaring Shear

NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y... *p.* 312

LABORATORY APPARATUS

Bario-Metal Corp'n, 167 W. 18th St., New York

BROWN INSTRUMENT CO., Philadelphia, Pa... *p.* 531

Central Scientific Co., 460 E. Ohio St., Chicago, Ill.

Eimer & Amend, 205 3rd Ave., New York

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp.* 20, 21, 521

Hanovia Chemical & Mfg. Co., Chestnut St. & N. J. R. R. Ave., Newark, N. J.

Hoskins Mfg. Co., 467 Lawton Ave., Detroit, Mich.

Scientific Materials Co., Pittsburgh, Pa.

Standard Scientific Co., 70 Fifth Ave., New York

L**LABORATORY WARE**

Corning Glass Works, Corning, N. Y.

NORTON CO., Worcester, Mass... *p.* 391

LACE LEATHER

Consolidated Belting Co., 2 Jeffrey St., Chester Pa.

Cook Belting Co., H. N., 401 Howard St., San Francisco, Cal.

Coupe Co., Wm., Ltd. (Excelsior), South Attleboro, Mass.

Couse & Bolten, 42 Lafayette St., Newark, N. J.

Druid Oak Belting Co., Inc., 111 E. Lombard St., Baltimore, Md.

Etsweiler Co., William (Diamond), 230 N. 3rd St., Philadelphia, Pa.

GRATON & KNIGHT MFG. CO., Worcester, Mass... *p.* 237

Hudson Belting Co., Worcester, Mass.

Ireson, Charles L., 221 High St., Boston, Mass.

Jewell Belting Co., Hartford, Conn.

Johnson Belting Co., 342 E. 38th St., New York

Ladew Co., Inc., Edward R., Glen Cove, N. Y.

McCauley Belting Co., 412-420 Orleans St., Chicago, Ill.

National Leather Belting Co., 342 E. 38th St., New York

Norwich Belting Co., Norwich, Conn.

Olmsted-Flint Co., Cambridge, Mass.

RHOADS & SONS, J. E., 12 N. Third St., Philadelphia, Pa... *pp.* 238, 239

*SCHIEREN CO., CHAS. A., 30-38 Ferry St., New York... *p.* 240

Schwartz Belting Co., 76 Murray St., New York

SHULTZ BELTING CO., St. Louis, Mo... *p.* 241

Walker's Sons & Co., Chas. W., 288 Market St., Newark, N. J.

Western Rawhide & Belting Co., 7th Ave. & S. Pierce St., Milwaukee, Wis.

LADLES

Central Foundry Supply Co., Columbus, O.

MARK MFG. CO., P. O. Box G, Chicago, Ill... *p.* 160

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p.* 496

PHOENIX IRON WORKS CO., Meadville, Pa... *p.* 497

Treadwell Construction Co., Midland, Pa.

LAMP BRACKETS (Adjustable)

MCCROSKY REAMER CO., Meadville, Pa... *pp.* 380, 381

Newman Mfg. Co., 719 Sycamore St., Cincinnati, O.

LAMP GUARDS, ELECTRIC

BENJAMIN ELECTRIC MFG. CO., 122 S. Sangamon St., Chicago, Ill... *p.* 504

*FLEXIBLE STEEL LACING CO., 522 S. Clinton St., Chicago, Ill... *p.* 248

Hubbell, Inc., Harvey, Bridgeport, Conn.

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p.* 162

LAMP MAKING MACHINERY (Incandescent)

York Electric & Machine Co., 30-34 N. Penn St., York, Pa.

LAMP SOCKETS

BENJAMIN ELECTRIC MFG. CO., 122 S. Sangamon St., Chicago, Ill... *p.* 504

Hubbell, Inc., Harvey, Bridgeport, Conn.

LAMPS**—Acetylene**

Carbic Mfg. Co., Duluth, Minn.

—Incandescent

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp.* 20, 21, 521

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp.* 114, 115

—Mine (Safety)

Edison Storage Battery Co., Orange, N. J.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp.* 114, 115

Wetherbee Igniter Co., 132 Liberty St., Springfield, Mass.

Advertisements of firms marked * appear in The Journal, A. S. M. E.

LATHE ATTACHMENTS

Curtis & Curtis Co., 188 Garden St., Bridgeport, Conn.
 McCROSKY REAMER CO., Meadville, Pa...
pp. 380, 381
 Newman Mfg. Co., 717 Sycamore St., Cincinnati, O.
 SLOCUM, AVRAM & SLOCUM LABORATORIES, INC., 531-537 W. 21st St., New York...*p. 538*
 Stewart, A. R., Nashville, Tenn.

LATHE DOGS

McCROSKY REAMER CO., Meadville, Pa...
pp. 380, 381
 WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...*p. 397*

LATHES**—Automatic**

CLEVELAND AUTOMATIC MACHINE CO., Cleveland, O...*p. 333*
 GIDDINGS & LEWIS MFG. CO., Fond du Lac, Wis...*p. 342*
 Gisholt Machine Co., Madison, Wis.
 GREAVES-KLUSMAN TOOL CO., Cincinnati, O...*p. 320*
 *JONES & LAMSON MACHINE CO. (Fay), Springfield, Vt...*pp. 324, 325, 326, 327*
 McCabe, J. J., 149 Broadway, New York

—Automatic Staff

Davenport Machine Tool Co., 34 N. 2nd St., New Bedford, Mass.

—Axle

Bridgeford Machine Tool Works, Winton Road, Rochester, N. Y.
 Fitchburg Machine Works, Fitchburg, Mass.
 NILES-BEMENT-POND CO., 111 Broadway, New York...*p. 344*

—Bench

American Watch Tool Co., Waltham, Mass.
 Dalton Manufacturing Corp'n, 1915 Park Ave., New York
 Elgin Tool Works, Elgin, Ill.
 Hardinge Bros., Inc., 1770 Beateau Ave., Chicago, Ill.
 Oliver Mfg. Co., W. W., Buffalo, N. Y.
 Rivett Lathe & Grinder Co., Brighton, Boston, Mass.
 Savage & Love Co., 710 S. Main St., Rockford, Ill.
 SLOAN & CHACE MFG. CO., LTD., Sixth Ave. Cor. N. 13th St., Newark, N. J...*p. 357*
 Stark Tool Co., Waltham, Mass.
 Worcester Lathe Co., 68 Prescott St., Worcester, Mass.

—Bevel Gear Turning

Bridgeford Machine Tool Works, Winton Road, Rochester, Mass.
 *JONES & LAMSON MACHINE CO., Springfield, Vt...*pp. 324, 325, 326, 327*

—Bobbin

Murkland Co., J. W., Barton, Vt.

—Brass

ACME MACHINE TOOL CO., Cincinnati, O...
p. 319
 NILES-BEMENT-POND CO., 111 Broadway, New York...*p. 344*
 Wachs Co., E. H., 1525 Dayton St., Chicago, Ill.

*WARNER & SWASEY CO., Cleveland, O...
pp. 328, 329

WOOD TURRET MACHINE CO., Brazil, Ind...*pp. 330, 331*

—Brass Finishers

AMERICAN TOOL & MACHINE CO., Boston, Mass...*p. 490*

—Brass Forming

ACME MACHINE TOOL CO., Cincinnati, O...
p. 319
 Meriden Machine Tool Co., Meriden, Conn.

—Chucking

ACME MACHINE TOOL CO., Cincinnati, O...
p. 319

Cincinnati Lathe & Tool Co., 3207-3211 North St., Oakley, Cincinnati, O.
 GREAVES-KLUSMAN TOOL CO., Cincinnati, O...*p. 320*

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass...*pp. 374, 375*
 INTERNATIONAL MACHINE TOOL CO., 1124 W. 21st St., Indianapolis, Ind...*pp. 322, 323*

*JONES & LAMSON MACHINE CO., Springfield, Vt...*pp. 324, 325, 326, 327*
 Lodge & Shipley Machine Tool Co., Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York...*p. 344*

WOOD TURRET MACHINE CO., Brazil, Ind...*pp. 330, 331*

—Chucking (Semi-Automatic)

CLEVELAND AUTOMATIC MACHINE CO., Cleveland, O...*p. 333*

—Cranksaft

Fitchburg Machine Works, Fitchburg, Mass.
 Lodge & Shipley Machine Tool Co., Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York...*p. 344*

Wickes Bros., Saginaw, Mich.

—Engine

American Tool Works Co., Pearl & Eggleston Aves., Cincinnati, O.

Bay State Iron Works, Erie, Pa.
 Bradford Machine Tool Co., 657 Evans St., Cincinnati, O.

Bridgeford Machine Tool Works, Winton Road, Rochester, N. Y.

Champion Tool Works Co., 2422 Spring Grove Ave., Cincinnati, O.

Cincinnati Lathe & Tool Co., 3208-3211 North St., Oakley, Cincinnati, O.

Cisco Machine Tool Co., Elmore & Ch. & D. Ry., Cincinnati, O.

Cleveland Machinery & Supply Co., Cleveland National Bank Bldg., Cleveland, O.

Crawford Machine Tool Co., Inc., 21 Park Row, New York

*CLYDE IRON WORKS, 29th Ave. W., & Michigan St., Duluth, Minn...*p. 268*

Davenport Locomotive Works, Davenport, Iowa

Davis Machine Tool Co., Inc., 305 St. Paul St., Rochester, N. Y.

Fay & Egan Co., J. A., Cincinnati, O.
 Fay & Scott, Dexter, Me.

Flather & Co., Inc., 29 Crown St., Nashua, N. H.

GIDDINGS & LEWIS MFG. CO., Fond du Lac, Wis...*p. 342*

GREAVES-KLUSMAN TOOL CO., Cincinnati, O...*p. 320*

Hamilton Machine Tool Co., Hamilton, O.
 Hendey Machine Co., Torrington, Conn.

HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York...*p. 350*

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O...*pp. 48, 49, 321*

Johnson, Jr., Co., Inc., I. H., 337 N. 15th St., Philadelphia, Pa.

LeBlond Machine Tool Co., R. K., Cincinnati, O.

Lehmann Machine Co., 606-612 S. Broadway, St. Louis, Mo.

Leland-Gifford Co., Worcester, Mass.

Lodge & Shipley Machine Tool Co., Cincinnati, O.

LYND-FARQUHAR CO., Boston, Mass...*p. 348*

Mann, Chas. A., 166 Doyle Ave., Providence, R. I.

Monarch Machine Tool Co., Sidney, O.

Morris Machine Tool Co., Cincinnati, O.

Mueller Machine Tool Co., 2425 Colerain Ave., Cincinnati, O.

Mulliner-Enlund Tool Co., Inc., Syracuse, N. Y.

Myers Machine Tool Co., Second & Chestnut Sts., Columbia, Pa.

Lat

LATHES (Continued)

—**Engine**

National Lathe Co., 15 W. 2nd St., Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Oliver Machinery Co., Grand Rapids, Mich.

Pittsburgh Machine Tool Co., Braddock, Pa.

Porter-Cable Machine Co., 1708 N. Salina St., Syracuse, N. Y.

PRATT & WHITNEY CO., 111 Broadway, New York... *p. 344*

Rahn-Larmon Co., 2941 Spring Grove Ave., Cincinnati, O.

Rockford Tool Co., Rockford, Ill.

San Francisco Engineering Co., 322-324 6th St., San Francisco, Cal.

Sebastian Lathe Co., Cincinnati, O.

Seneca Falls Mfg. Co., 314-340 Fall St., Seneca Falls, N. Y.

Shepard Lathe Co., Cincinnati, O.

Smith Mfg. Co., Philip, Sidney, Ohio

South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.

Springfield Machine Tool Co., Springfield, O.

Sterling Machine Tool Co., Cincinnati, O.

Superior Machine Tool Co., Kokomo, Ind.

United States Lathe & Machine Co., Cincinnati, Ohio

Walcott Lathe Co., Jackson, Mich.

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

Wickes Bros., Saginaw, Mich.

Willard Machine & Tool Co., Cincinnati, O.

Worcester Lathe Co., 68 Prescott St., Worcester, Mass.

—**Foot Power**

Barnes Co., W. F. & John, Rockford, Ill.

Dalton Manufacturing Corp'n, 1915 Park Ave., New York

Mann, Chas. A., 166 Doyle Ave., Providence, R. I.

Savage & Love Co., 710 S. Main St., Rockford, Ill.

South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.

—**Gap**

Harrington Son & Co., Inc., Edwin, S. E. Cor. 17th & Callowhill Sts., Philadelphia, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Rahn-Larmon Co., 2941 Spring Grove Ave., Cincinnati, O.

South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.

—**Gun**

*CLYDE IRON WORKS, 29th Ave. W., & Michigan St., Duluth, Minn... *p. 268*

Gisholt Machine Co., Madison, Wis.

HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York... *p. 350*

HOUSTON STANWOOD, & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

Johnson, Jr., Co., Inc., I. H., 337 N. 15th St., Philadelphia, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

—**Heavy Duty**

Crawford Machine Tool Co., Inc., 21 Park Row, New York

Duff Mfg. Co., Pittsburgh, Pa.

GREAVES-KLUSMAN TOOL CO., Cincinnati, O... *p. 320*

Greenlee Bros. & Co., Rockford, Ill.

HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York... *p. 350*

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

INTERNATIONAL MACHINE TOOL CO., 1124 W. 21st St., Indianapolis, Ind... *pp. 322, 323*

National Lathe Co., 15 W. 2nd St., Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Pittsburgh Machine Tool Co., Braddock, Pa.
Pottstown Machine Co., Pottstown, Pa.
United States Lathe & Machine Co., Cincinnati, O.

—**Metal-Spinning**

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*

Meriden Machine Tool Co., Meriden, Conn.

Prybil Machine Co., P., 512 W. 41st St., New York

TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*

—**Precision**

Hardinge Bros., Inc., 1770 Berneau Ave., Chicago, Ill.

PRATT & WHITNEY CO., 111 Broadway, New York... *p. 344*

Rivett Lathe & Grinder Co., Brighton, Boston, Mass.

Van Norman Machine Tool Co., Springfield, Mass.

Wade, Walter H., 311 Atlantic Ave., Boston, Mass.

—**Projectile**

Cleveland Crane & Engineering Co., Wickliffe, O.

HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York... *p. 350*

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*

Johnson, Jr., Co., Inc., I. H., 337 N. 15th St., Philadelphia, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

—**Pulley**

Cincinnati Pulley Machinery Co., Cincinnati, O.

*JONES & LAMSON MACHINE CO., Springfield, Vt... *pp. 324, 325, 326, 327*

National Lathe Co., 15 W. 2nd St., Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

—**Roll**

Youngstown Foundry & Machine Co., Youngstown, O.

—**Screw-Cutting**

Automatic Machine Co., Bridgeport, Conn.

Cincinnati Lathe & Tool Co., 3207-3211 North St., Oakley, Cincinnati, O.

Cisco Machine Tool Co., Elmore & Ch. & D Ry., Cincinnati, O.

Dalton Manufacturing Corp'n, 1915 Park Ave., New York

Driggs Mfg. Corp'n, New Haven, Conn.

GIDDINGS & LEWIS MFG. CO., Fond du Lac, Wis... *p. 342*

GREAVES-KLUSMAN TOOL CO., Cincinnati, O... *p. 320*

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass... *pp. 374, 375*

Hamilton Machine Tool Co., Hamilton, O.

HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York... *p. 350*

Myers Machine Tool Co., Second & Chestnut Sts., Columbia, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Rivett Lathe & Grinder Co., Brighton, Boston, Mass.

Seneca Falls Mfg. Co., 314-340 Fall St., Seneca Falls, N. Y.

Shepard Lathe Co., Cincinnati, O.

SLOAN & CHACE MFG. CO., LTD., Sixth Ave., Cor. N. 13th St., Newark, N. J... *p. 357*

South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.

Sterling Machine Tool Co., Cincinnati, O.

Worcester Lathe Co., 68 Prescott St., Worcester, Mass.

—**Shafting**

Fitchburg Machine Works, Fitchburg, Mass.

Lat

Advertisements of firms marked * appear in The Journal, A. S. M. E.

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O. . . pp. 48, 49, 321

—Speed

***GREENFIELD TAP & DIE CORP'N**, Greenfield, Mass. . . pp. 374, 375
Mann, Chas. A., 166 Doyle Ave., Providence, R. I.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344
Seneca Falls Mfg. Co., 314-340 Fall St., Seneca Falls, N. Y.

—Tool Room

Bradford Machine Tool Co., 657 Evans St., Cincinnati, O.

Bradford Machine Tool Co., Inc., 21 Park Row, New York

Mather & Co., Inc., 29 Crown St., Nashua, N. H.
National Lathe Co., 15 W. 2nd St., Cincinnati, O.

Rockford Tool Co., Rockford, Ill.

Walcott Lathe Co., Jackson, Mich.

—Turret

ACME MACHINE TOOL CO., Cincinnati, O. . . p. 319

AMERICAN TOOL & MACHINE CO., Boston, Mass. . . p. 490

Bardons & Oliver, 1133 Ninth St., Cleveland, O.

Bradford Machine Tool Co., 657 Evans St., Cincinnati, O.

Champion Tool Works Co., 2444 Spring Grove Ave., Cincinnati, O.

Cincinnati Lathe & Tool Co., 3207-3211 North St., Oakley, Cincinnati, O.

Davis Machine Tool Co., Inc., 305 St. Paul St., Rochester, N. Y.

Dress Machine Tool Co., 227 W. McMicken Ave., Cincinnati, O.

Fay & Scott, Dexter, Me.

Foster Machine Co., Elkhart, Ind.

Gisholt Machine Co., Madison, Wis.

GREAVES-KLUSMAN TOOL CO., Cincinnati, O. . . p. 320

Greenlee Bros. & Co., Rockford, Ill.

***GREENFIELD TAP & DIE CORP'N**, Greenfield, Mass. . . pp. 374, 375

Hamilton Machine Tool Co., Hamilton, O.

HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York. . . p. 350

Hollingsworth Machine Tool Co., 2nd & Greenup Sts., Covington, Ky.

INTERNATIONAL MACHINE TOOL CO. (Libby), 1124 W. 21st St., Indianapolis, Ind. . . pp. 322, 323

***JONES & LAMSON MACHINE CO.** (Hartness), Springfield, Vt. . . pp. 324, 325, 326, 327

Millholland Machine Co., W. K., Indianapolis, Ind.

Monarch Machine Tool Co., Sidney, O.

Morris Machine Tool Co., Cincinnati, O.

Oliver Machinery Co., Grand Rapids, Mich.

Pierce Machine Tool Co., 617 W. Jackson Blvd., Chicago, Ill.

Potter & Johnston Machine Co., Pawtucket, R. I.

PRATT & WHITNEY CO., 111 Broadway, New York. . . p. 344

Rahn-Larmon Co., 1941 Spring Grove Ave., Cincinnati, O.

Reed-Prentice Co., Worcester, Mass.

Simplex Machine Tool Co., Cleveland, O.

Smurr & Kamen Co., 328 N. Albany Ave., Chicago, Ill.

Southworth Machine Co., Portland, Me.

STEINLE TURRET MACHINE CO., Madison, Wis. . . p. 332

***WARNER & SWASEY CO.**, Cleveland, O. . . pp. 328, 329

WOOD TURRET MACHINE CO. (Tilted Turret), Brazil, Ind. . . pp. 330, 331

—Turret (Semi-Automatic)

WOOD TURRET MACHINE CO., Brazil, Ind. . . pp. 330, 331

—Turret (Vertical)

BULLARD MACHINE TOOL CO., Bridgeport, Conn. . . p. 537

King Machine Tool Co., Winton Place Station, Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344

—Wheel

NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344

—Wood Turning

***GREENFIELD TAP & DIE CORP'N**, Greenfield, Mass. . . pp. 374, 375

Oliver Machinery Co., Grand Rapids, Mich.

Partridge, E. O., 2047-2049 W. Lake St., Chicago, Ill.

LEAD

—Calking

UNITED LEAD CO., 111 Broadway, New York. . . p. 299

—Pig

Marr & Sons A., 111 Broadway, New York

UNITED LEAD CO., 111 Broadway, New York. . . p. 299

United States Smelting Co., Inc., 120 Broadway, New York

—Sheet

UNITED LEAD CO., 111 Broadway, New York. . . p. 299

LEAD BURNING APPARATUS

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York. . . p. 505

LEAD PIPE MACHINERY

Robertson & Co., John, 133 Water St., Brooklyn, N. Y.

WATSON-STILLMAN CO., 35 Church St., New York. . . p. 457

LEAD WOOL

UNITED LEAD CO., 111 Broadway, New York. . . p. 299

LEATHER BELTING, PACKING, ETC.

(See Belting, Packing, etc., Leather)

LEATHER GOODS, MECHANICAL

Alexander Bros., 414 N. 3rd St., Philadelphia, Pa.

Michigan Leather Packing Co., Inc., Detroit, Mich.

Mooney Belting Co., Cincinnati, O.

Raniville Co., F., Grand Rapids, Mich.

SHULTZ BELTING CO., St. Louis, Mo. . . p. 241

Union Belt Co., Fall River, Mass.

LEATHER MACHINERY

Slocumb & Co., Inc., F. F., Wilmington, Del.

LEATHER SPLITTING MACHINES

AMERICAN TOOL & MACHINE CO., Boston, Mass. . . p. 490

LEATHER-WORKING MACHINERY

Fortuna Machine Co., 127 Duane St., New York

Slocumb & Co., Inc., F. F., Wilmington, Del.

LEATHERS

—Friction

American Oak Leather Co., Cincinnati, O.

GRATON & KNIGHT MFG. CO., Worcester, Mass. . . p. 237

***SCHIEREN CO.**, CHAS. A., 30-38 Ferry St., New York. . . p. 240

—Hydraulic

American Oak Leather Co., Cincinnati, O.

Bickford & Francis Belting Co., Buffalo, N. Y.

BURROUGHS CO., CHARLES, Newark, N. J. . . p. 454

Consolidated Belting Co., 2 Jeffrey St., Chester, Pa.

Cook Belting Co., H. N., 401 Howard St., San Francisco, Cal.

Eagle Counter & Leather Co., 414 E. 8th St., Cincinnati, O.

GRATON & KNIGHT MFG. CO., Worcester, Mass. . . p. 237

Lea

See Catalogue Section for data of firms listed in capital type

LEATHERS (Continued)**—Hydraulic**

MARK MFG. CO., P. O. Box G, Chicago, Ill.
...p. 160

*SCHIEREN CO., CHAS. A., 30-38 Ferry St.,
New York...p. 240

SHULTZ BELTING CO., St. Louis, Mo...p.
241

—Polishing

GRATON & KNIGHT MFG. CO., Worcester,
Mass...p. 237

*SCHIEREN CO., CHAS. A., 30-38 Ferry St.,
New York...p. 240

—Pump

American Oak Leather Co., Cincinnati, O.
Detroit Leather Specialty Co., Inc., 90 Beecher
Ave., Detroit, Mich.

GRATON & KNIGHT MFG. CO., Worcester,
Mass...p. 237

MARK MFG. CO., P. O. Box G, Chicago, Ill.
...p. 160

Norwich Belting Co., Norwich, Conn.

*SCHIEREN CO., CHAS. A., 30-38 Ferry St.,
New York...p. 240

—Textile

GRATON & KNIGHT MFG. CO., Worcester,
Mass...p. 237

*SCHIEREN CO., CHAS. A., 30-38 Ferry St.,
New York...p. 240

LEVERS, FLEXIBLE (Wire)

*GWILLIAM CO. (Bowden), 253 W. 58th St.,
New York...pp. 234, 235

LIGHTING PLANTS**—Acetylene**

OKWELD ACETYLENE CO., 646-686 Freling-
huysen Ave., Newark, N. J...p. 421

*WESTINGHOUSE ELECTRIC & MFG. CO.,
East Pittsburgh, Pa...pp. 114, 115

—Electric

Aerothrust Engine Co., La Porte, Mo.
Frost Engineering Co., Evansville, Wis.
Jantz & Leist Electric Co., Cincinnati, O.
Langstadt Meyer Co., Appleton, Wis.
Lausen-Lawton Co., De Pere, Wis.

—Railroad Car (Electric)

Electric Storage Battery Co., Allegheny Ave. &
19th St., Philadelphia, Pa.

*GENERAL ELECTRIC CO., Schenectady,
N. Y...pp. 20, 21, 521

Pyle-National Co., 1334 N. Kostner St., Chicago,
Ill.

SAFETY CAR HEATING & LIGHTING CO.,
2 Rector St., New York...p. 505

U. S. Light & Heat Corp'n, Niagara Falls, N. Y.

—Railroad Car (Gas)

SAFETY CAR HEATING & LIGHTING CO.,
2 Rector St., New York...p. 505

LIGHTNING-ARRESTERS

*GENERAL ELECTRIC CO., Schenectady,
N. Y...pp. 20, 21, 521

*JOHNS-MANVILLE CO., H. W., 296 Madison
Ave., New York...p. 162

*WESTINGHOUSE ELECTRIC & MFG. CO.,
East Pittsburgh, Pa...pp. 114, 115

LINERS (Pump and Press)

SANDUSKY FOUNDRY & MACHINE CO.,
Sandusky, O...p. 488

LININGS**—Brake**

Advance Packing & Supply Co., 11 N. Franklin
St., Chicago, Ill.

Asbestos & Rubber Works of America, 1784
Broadway, New York

Cork Insert Co., 164 Federal St., Boston, Mass.

Federal Asbestos Co., Paterson, N. J.

General Asbestos & Rubber Co., Charleston,
S. C.

GRATON & KNIGHT MFG. CO., Worcester,
Mass...p. 237

*JOHNS-MANVILLE CO., H. W., 296 Madison
Ave., New York...p. 162

Manhattan Rubber Mfg. Co., 61 Willett St.,
Passaic, N. J.

Russell Mfg. Co. (Rusco), Middletown, Conn.

United States Asbestos Co., Fehl Bldg., Lan-
caster, Pa.

—Cement Kiln

WASHBURN & GRANGER, 50 Church St.,
New York...p. 91

—Furnace

Betson Plastic Fire Brick Co. (Plastic), Rome,
N. Y.

Botfield Specialties Co., 776 S. Swanson St.,
Philadelphia, Pa.

CELITE PRODUCTS CO., 11 Broadway, New
York...p. 98

Crescent Refractories Co., Curwensville, Clear-
field County, Pa.

*JOHNS-MANVILLE CO., H. W., 296 Madison
Ave., New York...p. 162

Jointless Fire Brick Co., 1879 Kingsbury St.,
Chicago, Ill...p. 99

*QUIGLEY FURNACE SPECIALTIES CO.,
(Hytemplate), 26 Cortlandt St., New York...
pp. 94, 100

MARSHALL FOUNDRY CO., 1st Natl. Bank
Bldg., Pittsburgh, Pa...p. 496

Maurer & Son, Henry, 420 E. 23rd St., New
York

McLeod & Henry Co., Troy, N. Y.

WASHBURN & GRANGER, 50 Church St.,
New York...p. 91

—Stack

*JOHNS-MANVILLE CO., H. W., 296 Madison
Ave., New York...p. 162

WASHBURN & GRANGER, 50 Church St.,
New York...p. 91

LINKS, REPAIR

MARK MFG. CO., P. O. Box G, Chicago, Ill.
...p. 160

NEWHALL CHAIN FORGE & IRON CO.,
90 West St., New York...p. 279

LINOLEUM MACHINERY

Dienelt & Eisenhardt, Inc., 1304 N. Howard St.,
Philadelphia, Pa.

LIQUID FORGING MACHINERY

Morris Engineering Co., 39 Cortlandt St., New
York

LIQUID FUEL EQUIPMENT

*BEST, INC., W. N., 11 Broadway, New York
...p. 411

Johnson Co., S. T., 1337 Mission St., San Fran-
cisco, Cal.

PHOENIX IRON WORKS CO., Meadville,
Pa...p. 497

TATE-JONES & CO., INC., Pittsburgh, Pa...
pp. 416, 417

LOADERS**—Box Car**

Manierre Engineering & Machinery Co., Mil-
waukee, Wis.

—End

HOLMES & BROS., ROBT., Danville, Ill...p.
270

—Log

American Hoist & Derrick Co., St. Paul, Minn.

*BROWN HOISTING MACHINERY CO.,
Cleveland, O...p. 265

*CLYDE IRON WORKS, 29th Ave., W., &
Michigan St., Duluth, Minn...p. 268

*LIDGERWOOD MFG. CO., 96 Liberty St.,
New York...p. 271

—Portable

BROWN PORTABLE CONVEYING MA-
CHINERY CO., Chicago, Ill...p. 262

*CLYDE IRON WORKS, 29th Ave., W., &
Michigan St., Duluth, Minn...p. 268

*LINK-BELT CO., 39th St. & Stewart Ave.,
Chicago, Ill...p. 256

PORTABLE MACHINERY CO., Passaic,
N. J...p. 263

Lea

—Ship

Rowson, Drew & Clydesdale, Inc., 12 Bridge St., New York

—Wagon

BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill. . . *p. 262*

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis. . . *pp. 118, 119*

*CLYDE IRON WORKS, 29th Ave. W., & Michigan St., Duluth, Minn. . . *p. 268*

Gifford-Wood Co., Hudson, N. Y.

Hais Mfg. Co., Inc., George, 141st St. & Rider Ave., New York

Jeffrey Mfg. Co., 904 N. Fourth St., Columbus, O.

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill. . . *p. 256*

PORTABLE MACHINERY CO., INC., Passaic, N. J. . . *p. 263*

Universal Road Machinery Co., Kingston, N. Y.

LOCKERS (Metal)

Darby & Sons Co., Inc., Edward, 233-235 Arch St., Philadelphia, Pa.

Dexter Metal Mfg. Co., Camden, N. J.

Durand Steel Locker Co., 76 W. Monroe St., Chicago, Ill.

EDWARDS MFG. CO., 306-338 Eggleston Ave., Cincinnati, O. . . *p. 506*

Keighley Metal Ceiling & Mfg. Co., S., 124 3rd Ave., Pittsburgh, Pa.

Lyon Metallic Mfg. Co., Aurora, Ill.

Narragansett Machine Co., Providence, R. I.

Terrell's Equipment Co., Grand Rapids, Mich.

WRIGHT WIRE CO., Worcester, Mass. . . *p. 282*

LOCOMOTIVES**—Compressed Air**

Porter Co., H. K., 1208 Union Bank Bldg., Pittsburgh, Pa.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . *pp. 114, 115*

—Contractors

American Locomotive Co., 30 Church St., New York

Baldwin Locomotive Works, Philadelphia, Pa.

Fate Co., J. D., Plymouth, O.

Heisler Locomotive Works, Erie, Pa.

—Electric

Atlas Car & Mfg. Co., Cleveland, O.

*GENERAL ELECTRIC CO., Schenectady, N. Y. . . *pp. 20, 21, 521*

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y. . . *pp. 252, 253*

Jeffrey Mfg. Co., 904 N. Fourth St., Columbus, O.

Lakewood Engineering Co., Berea Road, Cleveland, Ohio

Morgan-Gardner Electric Co., 27th & Shields Ave., Chicago, Ill.

ROBINS CONVEYING BELT CO., Park Row Bldg., New York. . . *p. 257*

Simplex Surface Contact Co., Williamsport, Pa.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . *pp. 114, 115*

—Electric (Storage Battery)

Automatic Transportation Co., 2933 Main St., Buffalo, N. Y.

GENERAL ELECTRIC CO., Schenectady, N. Y. . . *pp. 20, 21, 521*

Goodman Mfg. Co., Halsted St. & 48th Place, Chicago, Ill.

HUNT CO., INC., C. W., West Brighton, Staten Island, N. Y. . . *pp. 252, 253*

Jeffrey Mfg. Co., 904 N. Fourth St., Columbus, O.

Lakewood Engineering Co., Berea Road, Cleveland, Ohio

Mancha Storage Battery Locomotive Co., 1909 S. Kings Highway, St. Louis, Mo.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . *pp. 114, 115*

Whitcomb Co., George D., Rochelle, Ill.

—Fireless

Porter Co., H. K., 1208 Union Bank Bldg., Pittsburgh, Pa.

—Gasoline

Baldwin Locomotive Works, Philadelphia, Pa.

Fate Co., J. D., Plymouth, O.

*GENERAL ELECTRIC CO., Schenectady, N. Y. . . *pp. 20, 21, 521*

McKeen Motor Car Co., 1222 Webster St., Omaha, Nebr.

Whitcomb Co., George D., Rochelle, Ill.

—Geared

Climax Mfg. Co., Corry, Pa.

Heisler Locomotive Works, Erie, Pa.

Lima Locomotive Works, Inc., Lima, O.

—Logging

Climax Mfg. Co., Corry, Pa.

Heisler Locomotive Works, Erie, Pa.

Lima Locomotive Works, Inc., Lima, O.

—Mine

American Locomotive Co., 30 Church St., New York

Fate Co., J. D., Plymouth, O.

*GENERAL ELECTRIC CO., Schenectady, N. Y. . . *pp. 20, 21, 521*

Goodman Mfg. Co., Halsted St. & 48th Place, Chicago, Ill.

Kester Electric Co., Terre Haute, Ind.

—Powdered Fuel

*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York. . . *p. 93*

—Steam

American Locomotive Co., 30 Church St., New York

Baldwin Locomotive Works, Philadelphia, Pa.

Davenport Locomotive Works, Davenport, Iowa

Lima Locomotive Works, Inc., Lima, O.

Porter Co., H. K., 1208 Union Bank Bldg., Pittsburgh, Pa.

Vulcan Iron Works, Wilkes-Barre, Pa.

LOGGING MACHINERY

*CLYDE IRON WORKS, 29th Ave. W., & Michigan St., Duluth, Minn. . . *p. 268*

FLORY MFG. CO., S., Bangor, Pa. . . *p. 269*

Garland Co., M., Bay City, Mich.

*LIDGERWOOD MFG. CO., 96 Liberty St., New York. . . *p. 271*

Ryther & Pringle Co., Carthage, N. Y.

Washington Iron Works, 1100 Seattle Boulevard, Seattle, Wash.

LOOMS

SCHAUM & UHLINGER, INC., Glenwood Ave. at Second St., Philadelphia, Pa. . . *pp. 492, 493*

—Circular

Royle & Sons, John, Paterson, N. J.

LUBRICANTS

ALBANY LUBRICATING CO., 708-10 Washington St., New York. . . *p. 173*

Borne, Scrymser Co., 80 South St., New York

Dearborn Chemical Co., 332 S. Michigan Ave., Chicago, Ill.

Dexter Oil Co., 313 Sixth Ave., Pittsburgh, Pa.

Franklin Oil & Gas Co., Bedford, O.

Indian Refining Co., Inc., 244 Madison Ave., New York

Ironsides Co., Columbus, O.

Kellogg & Co., E. H., 243-244 South St., New York

Keystone Lubricating Co., 21st, Clearfield & Lippincott Sts., Philadelphia, Pa.

New York & New Jersey Lubricant Co., 165 Broadway, New York

New York Lubricating Oil Co., 116 Broad St., New York

Petroleum Refining Co., 1502 Carter Bldg., Houston, Tex.

Philadelphia Grease Mfg. Co., 848-850 S. Swanson St., Philadelphia, Pa.

Robinson & Son Co., Wm. C., 32 South St., Baltimore, Md.

Lub

LUBRICANTS (Continued)

Standard Oil Co., Chicago, Ill.
SWAN & FINCH CO. (Slo-Flo), 165 Broadway, New York... *p. 174*

***THE TEXAS COMPANY** (Texaco), 17 Battery Place, New York... *p. 175*

TIDE WATER OIL CO., 11 Broadway, New York... *p. 176*

Vacuum Oil Co. (Gargoyle), 61 Broadway, New York

Watt's Sons, John M., 54 N. Second St., Philadelphia, Pa.

Waverly Oil Works Co., 54th St., Pittsburgh, Pa.

White & Bagley Co., 100 Foster St., Worcester, Mass.

—**Automobile**

Indian Refining Co., Inc., 244 Madison Ave., New York

***THE TEXAS COMPANY** (Texaco), 17 Battery Place, New York... *p. 175*

TIDE WATER OIL CO., 11 Broadway, New York... *p. 176*

Vacuum Oil Co. (Mobiloil), 61 Broadway, New York

White & Bagley Co., 100 Foster, Worcester, Mass.

White Star Refining Co., 614 Avery Ave., Detroit, Mich.

—**Flake Mica**

U. S. Mica Mfg. Co., 14 E. Jackson Blvd., Chicago, Ill.

—**Graphite**

ALBANY LUBRICATING CO., 708-10 Washington St., New York... *p. 173*

Acheson Graphite Co., Niagara Falls, N. Y.

Kelly Graphite Mills, 355 W. 26th St., New York

Randall Graphite Sheet Lubricator Co., 816-818 W. Lake St., Chicago, Ill.

LUBRICATORS

AMERICAN INJECTOR CO., Detroit, Mich... *p. 151*

American Lubricator Co., Detroit, Mich.

Bowen Products Corp'n, Auburn, N. J.

Collins Metallic Packing Co. (Collins), 56-58 N. Second St., Philadelphia, Pa.

Eastwood Wire Mfg. Co., Bellevue, N. J.

Lunkenheimer Co., Cincinnati, Ohio

Nathan Mfg. Co., Lawrence & Amity Sts., Flushing, Long Island, N. Y.

Ohio Grease Co., Loudonville, O.

Ohio Injector Co., S. Main St., Wadsworth, O.

Osgood Lubricator Co., J. L., 45 Pearl St., Buffalo, N. Y.

Swain Lubricator Co., 443 W. 37th St., Chicago, Ill.

Williams Valve Co., D. T., Cincinnati, O.

Wood, Robert, 15 Hawthorne St., Brooklyn, N. Y.

—**Driving Box (Locomotive)**

DETROIT LUBRICATOR CO., Detroit, Mich... *p. 167*

—**Elevator**

Kingsbridge Machine Works, Kingsbridge, New York, N. Y.

—**Force-Feed**

DETROIT LUBRICATOR CO., Detroit, Mich... *p. 167*

Dorn & Marcellus Co., Kinsey & Hedge Sts., Philadelphia, Pa.

***GREENE-TWEED & CO.**, 109 Duane St., New York... *p. 168*

Hills-McCanna Co., 153 W. Kinzie St., Chicago, Ill.

Inter-State Machine Products Co., Rochester, N. Y.

Krahn Mfg. Co., 590 Clinton St., Milwaukee, Wis.

McCord MFG. CO., Detroit, Mich... *p. 169*

McCullough Mfg. Co., Minneapolis, Minn.

MADISON-KIPP LUBRICATOR CO., Madison, Wis... *p. 172*

Manzel Bros. Co., 317 Babcock St., Buffalo, N. Y.

PICKERING GOVERNOR CO., Portland, Conn... *p. 166*

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

Weiss, Louis T., 286 Taaffe Place, Brooklyn, N. Y.

—**Graphite**

American Graphite Feeding Device Co., Manville, R. I.

National Graphite Lubricator Co., Scranton, Pa.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

—**Hydrostatic**

DETROIT LUBRICATOR CO., Detroit, Mich... *p. 167*

Electric Water Sterilizer & Ozone Co., Scottsdale, Pa.

Essex Brass Co., G. B., Detroit, Mich.

Flower & Co., Walter L., 312-314 S. 8th St., St. Louis, Mo.

Michigan Lubricator Co., 661 Beaubien St., Detroit, Mich.

LUMBER STACKING MACHINES

Soule Steam Feed Works, Meridan, Miss.

M**MACHINE HANDLES, SCREWS, ETC.**

(See Handles, Screws, etc., Machine)

MACHINE PARTS (Special)

BABSON-DOW MFG. CO., 60 Fulda St., Rosbury, Boston, Mass... *p. 399*

MACHINE TOOLS

ACME MACHINE TOOL CO., Cincinnati, O... *p. 319*

American Clay Machinery Co., Bucyrus, O.

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 490*

American Tool Works Co., Pearl & Eggleston Aves., Cincinnati, O.

Beaman & Smith Co., Providence, R. I.

Boeger-Meyer Machine & Tool Co., 59-65 McWhorter St., Newark, N. J.

BULLARD MACHINE TOOL CO., Bridgeport, Conn... *p. 537*

Chicago Machine Tool Co., 127 N. Canal St., Chicago, Ill.

Cincinnati Lathe & Tool Co., 3207-3211 North St., Oakley, Cincinnati, O.

Cincinnati Milling Machine Co., Cincinnati, O.

Cisco Machine Tool Co., Elmore & Ch. & D. Ry., Cincinnati, O.

COLBURN MACHINE TOOL CO., Franklin, Pa... *pp. 340, 341*

Defiance Machine Works, Defiance, O.

DILL MACHINE CO., INC., T. C., Philadelphia, Pa... *p. 345*

Eccles & Smith Co., 71 First St., San Francisco, Cal.

Enterprise Machinery Co., 34 S. Clinton St., Chicago, Ill.

***FELLOWS GEAR SHAPER CO.**, Springfield, Vt... *p. 349*

Fosdick Machine Tool Co., Blue Rock & Apple Sts., Cincinnati, O.

Foster Machine Co., Elkhart, Ind.

Gray Machine Tool Co., Inc., 2665 Main St., Buffalo, N. Y.

Gray Co., G. A., Gest & Depot Sts., Cincinnati, O.

Gurney Co., Honesdale, Pa.

Higley Machine Co., Croton Falls, N. Y.

Hill, Clarke & Co., Inc., 156 Oliver St., Boston, Mass.

HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York... *p. 350*

Holland Machine Co., 132 Water St., South Norwalk, Conn.

Lub

Hollingsworth Machine Tool Co., 2nd & Green-up Sts., Covington, Ky.
HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O., *pp.* 48, 49, 321
INTERNATIONAL MACHINE TOOL CO., 1124 W. 21st St., Indianapolis, Ind., *pp.* 322, 323

Jackson Machine Tool Co., Jackson, Mich.
***JONES & LAMSON MACHINE CO.**, Springfield, Vt., *pp.* 324, 325, 326, 327

KEARNEY & TRECKER CO., Milwaukee, Wis., *p.* 356

LANDIS MACHINE CO., INC., Waynesboro, Pa., *pp.* 372, 373

Lehmann Machine Co., 606-612 S. Broadway, St. Louis, Mo.

LYND-FARQUHAR CO., Boston, Mass., *p.* 348

Mann Corporation, Kankakee, Ill.

McCabe, J. J., 149 Broadway, New York
Manning, Maxwell & Moore, Inc., 119 W. 40th St., New York

Milbolland Machine Co., W. K., Indianapolis, Ind.

Mueller Machine Tool Co., 2425 Colerain Ave., Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York., *p.* 344

Phoenix Mfg. Co., Eau Claire, Wis.

PRATT & WHITNEY CO., 111 Broadway, New York., *p.* 344

St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo.

Sebastian Lathe Co., Cincinnati, O.
Sellers & Co., Inc., Wm., Philadelphia, Pa.

Sheperd Engineering Co., Williamsport, Pa.
Simmons Machine Co., Inc., Albany, N. Y.

Smith & Mills Co., Cincinnati, O.
Smith Mfg. Co., Philip, Sidney, Ohio

Somers, Fittler & Todd Co., 327 Water St., Pittsburgh, Pa.

STEINLE TURRET MACHINE CO., Madison, Wis., *p.* 332

Stow Mfg. Co., 443 State St., Binghamton, N. Y.

TURNER MACHINE CO., Danbury, Conn., *p.* 347

***WARNER & SWASEY CO.**, Cleveland, O., *pp.* 328, 329

Western Machine Tool Works, Holland, Mich.
Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

WOOD TURRET MACHINE CO., Brazil, Ind., *pp.* 330, 331

MACHINE WORK

Abramsen Engineering Co., Union Bank Bldg., Pittsburgh, Pa.

Affa Specialty Co., 34 Southbridge St., Worcester, Mass.

Automatic Machine Co., Bridgeport, Conn.
Bauroth Brothers, Springfield, O.

Bayard & Co., M. L., Woodbine, N. J.
BLAKE & JOHNSON CO., Waterbury, Conn., *p.* 482

Blount Engineering Co., 100 High St., Boston, Mass.

Braddock Mfg. Co., Braddock, Pa.
Bradley Mach. Co., Bridgeport, Conn.

BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa., *p.* 86

Burr Co., Champaign, Ill.

BURROUGHS CO., CHARLES, Newark, N. J., *p.* 454

Carver Cotton Gin Co., East Bridgewater, Mass.

Chandler & Taylor Co., Indianapolis, Ind.

Columbia Machine Tool Co., Fairgrove Ave., Hamilton, O.

Currier & Sons, Cyrus, Newark, N. J.

Custer Specialty Co., 26-28 N. Ludlow St., Dayton, O.

Diamond Tool & Mfg. Co., 164 Emmett St., Newark, N. J.

Diamond Machine Co., Monongahela, Pa.

Dominion Bridge Co., Ltd., Montreal, P. Q., Canada

Eagle Tool & Machine Co., 519-522 South Ave., N. S., Pittsburgh, Pa.

Easton Machine Co., Washington St., South Easton, Mass.

Eastwood Wire Mfg. Co., Belleville, N. J.
Empire Axle Co., Dunkirk, N. Y.

Frontier Iron Works, 38 Letchworth St., Buffalo, N. Y.

Gibbs Gas Engine Co. of Florida, 26 S. Main St., Jacksonville, Fla.

Gillespie Mfg. Corp'n, 12th & Monmouth Sts., Jersey City, N. J.

Hafer Foundry & Machine Works, Chambersburg, Pa.

Hart & Co., Inc., Frederick, 837 Main St., Poughkeepsie, N. Y.

Hefner & Maysilles, Grafton, W. Va.

Hershey Machine & Foundry Co., Manheim, Pa.

***HILL CLUTCH CO.**, Cleveland, O., *p.* 208

JOHNSON MACHINE CO., CARLYLE, Manchester, Conn., *p.* 209

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill., *p.* 194

Katzenstein & Co., L., 358 West St., New York

Klotz Machine Co., 318 W. Water St., Sandusky, O.

Knowlson & Kelly, Troy, N. Y.

Krasberg Mfg. Co., 536 Lake Shore Drive, Chicago, Ill.

***LAMBERT & MANN CO.**, Wood & Walnut Sts., Chicago, Ill., *p.* 448

Lebanon Gear & Machine Wks., 15th & Forge Sts., Lebanon, Pa.

Lincoln Machine Co., Maine & Carver Sts., Pawtucket, R. I.

Lyall, J. & W., Passaic, N. J.

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa., *p.* 496

Marx & Sons, A., 1545 Tchoupitoulas St., New Orleans, La.

MEHL MACHINE TOOL & DIE CO., Roselle, N. J., *pp.* 376, 377

Meisselbach-Catucci Mfg. Co., 24 Congress St., Newark, N. J.

Modern Mfg. Co., 75 Third St., Bridgeport, Conn.

Moline Machinery Co., Cor. 3rd Ave. & 20th St., Moline, Ill.

Morgans & Wilcox Mfg. Co., Middletown, N. Y.

Munson, E. G., Carton Ave., Utica, N. Y.

National Gauge Co., 300 Pacific St., Brooklyn, N. Y.

Nazareth Foundry & Machine Co., 41-45 Easton Road, Nazareth, Pa.

Nelsonville Foundry & Machine Co., Nelsonville, O.

Nestor Mfg. Co., 40 W. 13th St., New York

Phoenix Ice Machine Co., 2711 Church Ave., Cleveland, O.

Poorman Co., O. O., New Bremen, O.

Riverside Machine Co., Front & Penn Sts., Chester, Pa.

Rochester Welding Works, 349 Orchard St., Rochester, N. Y.

Russell Wheel & Foundry Co., Detroit, Mich.

Schaeffer Machine Works, 35th & Grays Ferry Road, Philadelphia, Pa.

Schmidt Co., F. L., 150 11th Ave., New York

Shepard Lathe Co., Cincinnati, O.

SLOCUM, AVRAM & SLOCUM LABORATORIES, INC., 531-537 W. 21st St., New York., *p.* 538

Snead & Co., Iron Works, Foot of Pine St., Jersey City, N. J.

Sommerfield Machine & Mfg. Co., 220 2nd Ave., Pittsburgh, Pa.

Standard Engineering Co., Ellwood City, Pa.

Sterling Machine Tool Co., Cincinnati, O.

Taft-Peirce Mfg. Co., Woonsocket, R. I.

Thacher & Co., George H., Albany, N. Y.

Thomas Spacing Machine Co., 1226 Fulton Bldg., Pittsburgh, Pa.

TORRINGTON MFG. CO., Torrington, Conn., *p.* 483

Mac

MACHINE WORK (Continued)

Townsend Furnace & Machine Shop Co., Broadway & Rensselaer St., Albany, N. Y.
 Union Gear & Machine Co., 27 Purchase St., Boston, Mass.

*VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis... *p. 18*
 Wallace, J. D., 1401 W. Jackson Blvd., Chicago, Ill.

Weiss, Louis T., 286 Taaffe Place, Brooklyn, N. Y.

West Coast Iron Works, 4601-9 Fourteenth Ave., N. W., Seattle, Wash.

Winchester Repeating Arms Co., New Haven, Conn.

MACHINERY

(Is listed under the specific headings)

MACHINERY GUARDS (Perforated Metal)
 Erdle Perforating Co., 171 York St., Rochester, N. Y.

MAGNESIA PRODUCTS

CAREY CO., PHILIP, Cincinnati, O... *pp. 164, 165*

EHRET MAGNESIA MFG. CO., Valley Forge, Pa... *pp. 164, 165*

FRANKLIN MFG. CO., Franklin, Pa... *pp. 164, 165*

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*

*MAGNESIA ASSOCIATION OF AMERICA, 721 Bulletin Bldg., Philadelphia, Pa... *pp. 164, 165*

MAGNETS, LIFTING

Cutler-Hammer Mfg. Co., 12th St. & St. Paul Ave., Milwaukee, Wis.

Electric Controller & Mfg. Co., Cleveland, O.

Ohio Electric & Controller Co., 5900 Maurice Ave., Cleveland, O.

MALTING MACHINERY

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis... *p. 455*

MANDRELS

ATKINS & CO., INC., E. C., Indianapolis, Ind... *p. 385*

CLEVELAND TWIST DRILL CO., Cleveland, O... *p. 378*

Nicholson & Co., W. H., Wilkes-Barre, Pa.

—Blacksmiths'

Noyes & Co., B. B., Greenfield, Mass.

—Expanding

Hannifin Mfg. Co., Chicago, Ill.

Nicholson & Co., W. H., Wilkes-Barre, Pa.

PRATT & WHITNEY CO., 111 Broadway,

New York... *p. 344*

Western Tool & Mfg. Co., Springfield, O.

—Expanding (Air-Operated)

MANUFACTURERS EQUIPMENT CO., Wal-ler & Fillmore Sts., Chicago, Ill... *p. 382*

MANHOLE FITTINGS

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

*CENTRAL FOUNDRY CO., 90 West St., New York... *p. 155*

LUKENS STEEL CO., Coatesville, Pa... *p. 69*

GLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa... *p. 68*

UNIFLOW BOILER CO., INC., Philadelphia, Pa... *p. 62*

MANIFOLDS

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa... *p. 294*

American Tube Bending Co., New Haven, Conn.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 494*

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

MANOMETERS

*FOXBORO CO., INC., Foxboro, Mass... *p. 533*

*PRECISION INSTRUMENT CO., Detroit Mich... *p. 524*

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... *p. 534*

TAGLIABUE MFG. CO., C. J., 18-88 33rd St Brooklyn, N. Y... *p. 535*

MARINE LIGHTING APPARATUS

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York... *p. 505*

MARKING DEVICES

Matthews & Co., Jas. H., 3942 Forbes St., Pittsburgh, Pa.

NOBLE & WESTBROOK MFG. CO., Hartford, Conn... *p. 368*

MARKING MACHINES

NOBLE & WESTBROOK MFG. CO., Hartford, Conn... *p. 368*

MEASURING AND MIXING MACHINES

CONVEYING WEIGHER CO., 90 West St., New York... *p. 251*

MEASURING MACHINES

—Lumber

Tally-Meter Co., 17 Elmwood Ave., Norwich, Conn.

—Wire

NEW ENGLAND BUTT CO., Providence, R. I... *p. 484*

TEXTILE MACHINE WORKS, Reading, Pa... *p. 485*

MECHANICAL DRAFT APPARATUS

AMERICAN BLOWER CO., Detroit, Mich... *pp. 434, 435*

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Clarage Fan Co., Kalamazoo, Mich.

COFFUS ENGINEERING & EQUIPMENT Co., Worcester, Mass... *pp. 76, 77*

DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*

*GREEN FUEL ECONOMIZER CO., 90 West St., New York... *p. 73*

Massachusetts Blower Co., Howard St., Water-town, Mass.

STERLING BLOWER CO., Hartford, Conn... *p. 436*

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*

Vapor-Vacuum Heating Co., Philadelphia, Pa.

MECHANICAL STOKERS

(See Stokers)

MERCHANT CASING

MONONGAHELA TUBE CO., Pittsburgh, Pa... *p. 70*

METAL BEARINGS, HOSE, PACKING, ETC.
 (See Bearings, Hose, Packing, etc., Metal)

METAL SPINNING

*PRECISION INSTRUMENT CO., Detroit, Mich... *p. 524*

METAL TREATING

*AMERICAN METAL TREATMENT CO., Elizabeth, N. J... *p. 418*

Ball & Roller Bearing Co., Danbury, Conn... Connecticut Metal Treating Co., Inc., 207 Knowlton St., Bridgeport, Conn.

ROCKWELL CO., W. S., 50 Church St., New York... *p. 413*

Schwab, Gustav, 525 Market St., San Francisco, Cal.

TATE-JONES & CO., INC., Pittsburgh, Pa... *pp. 416, 417*

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... *p. 397*

METAL WHEEL MACHINERY

Heartley Machine, Variety Iron & Tool Works, Summit & Locust Sts., Toledo, O.

METALLOGRAPHIC APPARATUS

Holz, Herman A., 1 Madison Ave., New York

METALS

—Acid Resistant

Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.

Bario-Metal Corp'n, 167 W. 18th St., New York

Mac

Duriron Castings Co. (Duriron), 90 West St., New York

UNITED LEAD CO., 111 Broadway, New York...*p.* 299

—Anti-Friction

ALLAN & SON, A. Harrison, N. J...*pp.* 286, 287

*AMERICAN BRONZE CORP'N (Non-Gran), Berwyn, Pa...*pp.* 288, 289

DODGE SALES & ENGINEERING CO., Mishawaka, Ind...*pp.* 202, 203, 204, 205, 206

Frictionless Metal Co., 1103 Chestnut St., Chattanooga, Tenn.

Leddell Metals Co., Inc., 281 Borden Ave., Long Island City, N. Y.

LUMEN BEARING CO., Buffalo, N. Y...*p.* 290

Magnolia Metal Co., 113-115 Bank St., New York

UNITED LEAD CO., 111 Broadway, New York...*p.* 299

—Bearing

Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.

ALLAN & SON, A. Harrison, N. J...*pp.* 286, 287

*AMERICAN BRONZE CORP'N (Non-Gran), Berwyn, Pa...*pp.* 288, 289

DODGE SALES & ENGINEERING CO., Mishawaka, Ind...*pp.* 202, 203, 204, 205, 206

Fahrig Metal Co., 34 Commerce St., New York

Frictionless Metal Co. (Frictionless), 1103 Chestnut St., Chattanooga, Tenn.

Jacobson & Sons Co., I. M. (Motex), 70-72 Catherine St., Detroit, Mich.

LUMEN BEARING CO., Buffalo, N. Y...*p.* 290

Magnolia Metal Co., 113-115 Bank St., New York

Murdock & Co., H., 432 Wood St., Pittsburgh, Pa.

Murphy Metals Co., 818 Webster Bldg., Chicago, Ill.

UNITED LEAD CO., 111 Broadway, New York...*p.* 299

—Extruded

AMERICAN BRASS CO., Waterbury, Conn...*p.* 295

—Heat Resisting

Bario Metal Corp'n, 167 W. 18th St., New York

—Perforated

Clinton Wire Cloth Co., Boston, Mass.

Cross Engineering Co., Carbondale, Pa.

Erdle Perforating Co., 171 York St., Rochester, N. Y.

Harrington & King Perforating Co., 629 N. Union Ave., Chicago, Ill.

Hendrick Mfg. Co., Carbondale, Pa.

Manhattan Perforated Metal Co., 237 Centre St., New York

Mundt & Sons, Charles, 53-56 Fairmount Ave., Jersey City, N. J.

—Silicon

CARBORUNDUM CO., Niagara Falls, N.Y...*p.* 389

—Thermostatic

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp.* 20, 21, 521

—Welding

WILSON WELDER & METALS CO., INC., 2 Rector St., New York...*p.* 423

—White

Imperial Type Metal Co., Philadelphia, Pa.

Leddell Metals Co., Inc., 281 Borden Ave., Long Island City, N. Y.

Murphy Metals Co., 818 Webster Bldg., Chicago, Ill.

Pittsburgh White Metal Co., 160 Leroy St., New York

Syracuse Smelting Works, 192 Diamond St., Brooklyn, N. Y.

UNITED LEAD CO., 111 Broadway, New York...*p.* 299

METERS

—Air and Gas

Bacharach Industrial Instrument Co., 422 First Ave., Pittsburgh, Pa.

*BAILEY METER CO., 141 Milk St., Boston, Mass...*p.* 519

*BUILDERS IRON FOUNDRY, Providence, R. I...*p.* 520

*FOXBORO CO., INC., Foxboro, Mass...*p.* 533

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp.* 20, 21, 521

New Jersey Meter Co., Plainfield, N. J.

*PRECISION INSTRUMENT CO., Detroit, Mich...*p.* 524

REPUBLIC FLOW METERS CO., 565 W. Washington Blvd., Chicago, Ill...*p.* 522

—Coal

HAYS CORP'N, JOS. W., Michigan City, Ind...*p.* 523

—Compressed Air

*BAILEY METER CO., 141 Milk St., Boston, Mass...*p.* 519

*BUILDERS IRON FOUNDRY, Providence, R. I...*p.* 520

*FOXBORO CO., INC., Foxboro, Mass...*p.* 533

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp.* 20, 21, 521

Kreutzberg Meter Co., 9 S. Clinton St., Chicago, Ill.

New Jersey Meter Co., Plainfield, N. J.

—Condensation

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y...*p.* 140

*BUILDERS IRON FOUNDRY, Providence, R. I...*p.* 520

Central Station Steam Co., 710 E. Woodbridge St., Detroit, Mich.

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa...*pp.* 104, 105

Plant Engineering & Equipment Co., 6 Church St., New York

SIMMONS CO., JOHN, 110 Center St., New York...*p.* 515

—Electric

(See Ammeters, Voltmeters, Wattmeters)

—Feed Water

*BAILEY METER CO., 141 Milk St., Boston, Mass...*p.* 519

*BUILDERS IRON FOUNDRY, Providence, R. I...*p.* 520

Central Station Steam Co., 710 E. Woodbridge St., Detroit, Mich.

*FOXBORO CO., INC., Foxboro, Mass...*p.* 533

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp.* 20, 21, 521

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa...*pp.* 104, 105

REPUBLIC FLOW METERS CO., 565 W. Washington Blvd., Chicago, Ill...*p.* 522

SIMMONS CO., JOHN, 110 Center St., New York...*p.* 515

WILLCOX ENGINEERING CO., Saginaw, Mich...*p.* 516

*YARNALL-WARING CO. (Yarway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa...*p.* 139

—Feed Water

(See Weir Type)

*BAILEY METER CO., 141 Milk St., Boston, Mass...*p.* 519

Booth Co., L. M., 62 Hudson St., Jersey City, N. J.

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa...*pp.* 104, 105

Hoppes Mfg. Co., 19 Larch St., Springfield, O.

Met

METERS (Continued)**—Feed Water (Weir Type)**

WEBSTER & CO., WARREN, Camden, N. J.
R. I...*p. 108, 109, 110*

*YARNALL-WARING CO. (Yarway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa...*p. 139*

—Gasoline

Buffalo Meter Co., 2917 Main St., Buffalo, N. Y.

*BUILDERS IRON FOUNDRY, Providence, R. I...*p. 520*

*FOXBORO CO., INC., Foxboro, Mass...*p. 533*

*NATIONAL METER CO., 299 Broadway, New York...*pp. 33, 517*

NEPTUNE METER CO., 50 E. 42nd St., New York...*p. 518*

SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*

—Oil

Buffalo Meter Co., 2917 Main St., Buffalo, N. Y.

*BUILDERS IRON FOUNDRY, Providence, R. I...*p. 520*

*FOXBORO CO., INC., Foxboro, Mass...*p. 533*

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa...*pp. 104, 105*

Kreutzberg Meter Co., 9 S. Clinton St., Chicago, Ill.

*NATIONAL METER CO., 299 Broadway, New York...*pp. 33, 517*

NEPTUNE METER CO., 50 E. 42nd St., New York...*p. 518*

SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*

Union Water Meter Co., 33 Hermon St., Worcester, Mass.

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*

*YARNALL-WARING CO. (Yarway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa...*p. 139*

Met**—Pitot Tube**

AMERICAN BLOWER CO., Detroit, Mich.
...*pp. 434, 435*

Bacharach Industrial Instrument Co., 422 First Ave., Pittsburgh, Pa.

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp. 20, 21, 521*

Lockett & Co., Ltd., A. M., New Orleans, La.

Pitometer Co., 25 Elm St., New York

*PRECISION INSTRUMENT CO., Detroit, Mich...*p. 524*

REPUBLIC FLOW METERS CO., 565 W. Washington Blvd., Chicago, Ill...*p. 522*

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y...*p. 534*

—Steam

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y...*p. 140*

*BAILEY METER CO., 141 Milk St., Boston, Mass...*p. 519*

*BUILDERS IRON FOUNDRY, Providence, R. I...*p. 520*

*FOXBORO CO., INC., Foxboro, Mass...*p. 533*

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp. 20, 21, 521*

New Jersey Meter Co., Plainfield, N. J.

REPUBLIC FLOW METERS CO., 565 W. Washington Blvd., Chicago, Ill...*p. 522*

—Venturi

*BUILDERS IRON FOUNDRY, Providence, R. I...*p. 520*

*NATIONAL METER CO., 299 Broadway, New York...*pp. 33, 517*

*PRECISION INSTRUMENT CO., Detroit, Mich...*p. 524*

Simplex Valve & Meter Co., 625 Wood St., Philadelphia, Pa.

—Water

*BAILEY METER CO., 141 Milk St., Boston, Mass...*p. 519*

Buffalo Meter Co., 2917 Main St., Buffalo, N. Y.

*BUILDERS IRON FOUNDRY, Providence, R. I...*p. 520*

*FOXBORO CO., INC., Foxboro, Mass...*p. 533*

Gamon Meter Co. (Watch Dog), 282-296 South St., Newark, N. J.

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp. 20, 21, 521*

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa...*pp. 104, 105*

Hersey Mfg. Co., South Boston, Mass.

*NATIONAL METER CO., 299 Broadway, New York...*pp. 33, 517*

NEPTUNE METER CO., 50 E. 42nd St., New York...*p. 518*

*PRECISION INSTRUMENT CO., Detroit, Mich...*p. 524*

SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*

Union Water Meter Co., 33 Hermon St., Worcester, Mass.

WILLCOX ENGINEERING CO., Saginaw, Mich...*p. 516*

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*

*YARNALL-WARING CO. (Yarway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa...*p. 139*

—Watt-Hour

*GENERAL ELECTRIC CO., Schenectady, N. Y...*pp. 20, 21, 521*

Roller-Smith Co., 233 Broadway, New York

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa...*pp. 114, 115*

MICA

U. S. Mica Mfg. Co., 14 E. Jackson Blvd., Chicago, Ill.

MICROMETERS

Almond Mfg. Co., T. R., Ashburnham, Mass.

Coats Machine Tool Co., Inc., 30 Church St., New York

*PRECISION INSTRUMENT CO., Detroit, Mich...*p. 524*

Slocumb Co., J. T., 35 Oxford St., Providence, R. I.

Starrett Co., L. S., Athol, Mass.

Syracuse Twist Drill Co., Syracuse, N. Y.

MILK HANDLING MACHINERY

Rice & Adams Corp'n, Buffalo, N. Y.

Rutland Mfg. Co., Inc., Forest, West & Pine Sts., Rutland, Vt.

MILL WEARING PARTS (Ball, Stamp and Tube)

American Manganese Steel Co., 1850 McCormick Bldg., Chicago, Ill.

Chrome Steel Works, Chrome, N. J.

*FULLER-LEHIGH CO., Fullerton, Pa...*p. 92*

MILLING AND DRILLING MACHINES (Combined)

Knight Machinery Co., W. B., 392 W. Pine St., St. Louis, Mo.

NILES-BEMENT-POND CO., 111 Broadway, New York...*p. 344*

UNIVERSAL BORING MACHINE CO., Hudson, Mass...*p. 343*

MILLING ATTACHMENTS

Adams Co., Dubuque, Iowa

BECKER MILLING MACHINE CO., Hyde Park, Boston, Mass...*p. 352*

Eccles & Smith Co., 71 First St., San Francisco, Cal.

KEARNEY & TRECKER CO., Milwaukee, Wis...*p. 356*

Porter-Cable Machine Co., 1708 N. Salina St., Syracuse, N. Y.

MILLING MACHINES**—Automatic**

***BILTON MACHINE TOOL CO.**, Bridgeport, Conn... *p.* 353

Cincinnati Milling Machine Co., Cincinnati, O.
Potter & Johnston Machine Co., Pawtucket, R. I.

PRATT & WHITNEY, 111 Broadway, New York... *p.* 344

—Bench

Burke Machine Tool Co., Conneaut, O.
Carter & Hakes Machine Co., Winsted, Conn.
Chicago Machine Tool Co., 127 N. Canal St., Chicago, Ill.

PRATT & WHITNEY CO., 111 Broadway, New York... *p.* 344

SLOAN & CHACE MFG. CO., LTD., Sixth Ave., Cor. N. 13th St., Newark, N. J... *p.* 357

Stark Tool Co., Waltham, Mass.
Wisconsin Miller Mfg. Co., 45th Ave. & Rogers St., Milwaukee, Wis.

—Band

Adams Co., Dubuque, Iowa
BECKER MILLING MACHINE CO., Hyde Park, Boston, Mass... *p.* 352

Bristol Machine Tool Co., Bristol, Conn.
Carter & Hakes Machine Co., Winsted, Conn.
Davenport Mfg. Co., Meadville, Pa.

PRATT & WHITNEY CO., 11 Broadway, New York... *p.* 344

Standard Engineering Works, Pawtucket, R. I.
WHITNEY MFG. CO., Hartford, Conn... *p.* 367

Wisconsin Miller Mfg. Co., 45th Ave. & Rogers St., Milwaukee, Wis.

—Heavy Duty

BECKER MILLING MACHINE CO., Hyde Park, Boston, Mass... *p.* 352

Brown & Sharpe Mfg. Co., Promenade St., Providence, R. I.
GOOLEY & EDLUND, INC., Cortland, N. Y. ... *p.* 354

KEARNEY & TRECKER CO., Milwaukee, Wis... *p.* 356

NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344

—Keyseat

Mitts & Merrill, 816 S. Franklin St., Saginaw, Mich.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344

WHITNEY MFG. CO., Hartford, Conn... *p.* 367

—Manufacturing

GOOLEY & EDLUND, INC., Cortland, N. Y. ... *p.* 354

KEARNEY & TRECKER CO., Milwaukee, Wis... *p.* 356

KEMPSMITH MFG. CO., Milwaukee, Wis... *p.* 355

NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344

WHITNEY MFG. CO., Hartford, Conn... *p.* 367

—Oil Groove

Fischer Machine Co., 310-316 N. 11th St., Philadelphia, Pa.

National Machine Tool Co., 2272 Spring Grove Ave., Cincinnati, O.

—Plain

Beaman & Smith Co., Providence, R. I.
BECKER MILLING MACHINE CO., Hyde Park, Boston, Mass... *p.* 352

***BILTON MACHINE TOOL CO.**, Bridgeport, Conn... *p.* 353

Cincinnati Milling Machine Co., Cincinnati, O.
Clough, R. M., Meridan, Conn.
Cook Co., Asa S., Hartford, Conn.
GOOLEY & EDLUND, INC., Cortland, N. Y. ... *p.* 354

Davenport Mfg. Co., Meadville, Pa.

Fox Machine Co., 1807 W. Ganson St., Jackson, Mich.

Garvin Machine Co., Spring & Varick Sts., New York

Gorton Machine Co., George, Racine, Wis.
Hendey Machine Co., Torrington, Conn.

KEARNEY & TRECKER CO., Milwaukee, Wis... *p.* 356

KEMPSMITH MFG. CO., Milwaukee, Wis... *p.* 355

Newton Machine Tool Works, Inc., 23rd & Vine Sts., Philadelphia, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344

Oesterlein Machine Co., 3301 Colerain Ave., Cincinnati, O.

Standard Engineering Works, Pawtucket, R. I.
Stephoe Co., John, Cincinnati, O.

U. S. Machine Tool Co., Richmond & McLean Ave., Cincinnati, O.

Valley City Machine Works, 12-16 Campau Ave., Grand Rapids, Mich.

***WARNER & SWASEY CO.**, Cleveland, O. ... *pp.* 328, 329

—Portable

Pedrick Tool & Machine Co., 3642 N. Lawrence St., Philadelphia, Pa.

Rooksby & Co., E. J., 435 N. Eleventh St., Philadelphia, Pa.

—Thread

Gale-Sawyer Co., 33 Wormwood St., Boston, Mass.

Gray Machine Tool Co., Inc., 2665 Main St., Buffalo, N. Y.

Lees-Bradner Co., 6210 Carnegie Ave., Cleveland, O.

PRATT & WHITNEY CO., 111 Broadway, New York... *p.* 344

Smalley General Co., Bay City, Mich.

Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Machine Works, Waltham, Mass.

—Universal

BECKER MILLING MACHINE CO., Hyde Park, Boston, Mass... *p.* 352

Brown & Sharpe Mfg. Co., Promenade St., Providence, R. I.

Cincinnati Milling Machine Co., Cincinnati, O.
Cleveland and Milling Machine Co., 18511 Euclid Ave., Cleveland, O.

Fox Machine Co., 1807 W. Ganson St., Jackson, Mich.

Garvin Machine Co., Spring & Varick Sts., New York

Ingersoll Milling Machine Co., Rockford, Ill.

KEARNEY & TRECKER CO., Milwaukee, Wis... *p.* 356

KEMPSMITH MFG. CO., Milwaukee, Wis... *p.* 355

Knight Machinery Co., W. B., 392 W. Pine St., St. Louis, Mo

LeBlond Machine Tool Co., R. K., Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344

Oesterlein Machine Co., 3301 Colerain Ave., Cincinnati, O.

Van Norman Machine Tool Co., Springfield, Mass.

—Vertical

BECKER MILLING MACHINE CO., Hyde Park Boston, Mass... *p.* 352

Cincinnati Milling Machine Co., Cincinnati, O.

Knight Machinery Co., W. B., 392 W. Pine St., St. Louis, Mo

NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344

—Wood

Oliver Machinery Co., Grand Rapids, Mich.

Woods Machine Co., S. A., 27 Damrell St., South Boston, Mass.

MILLS**—Attrition**

Bauer Bros. Co., Springfield, O.

Mil

See Catalogue Section for data of firms listed in capital type

MILLS (Continued)**—Attrition**

BUCKEYE IRON & BRASS WORKS, Dayton, O... *p. 481*

Munson Mill Machinery Co., Inc., 405 Broadway, Utica, N. Y.

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

—Ball

Abbé, Paul O., 30 Broad St., New York

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

BONNOT CO., Canton, O... *p. 464*

Braddock Mfg. Co., Braddock, Pa.

CHALMERS & WILLIAMS, 1450 Arnold St., Chicago Heights, Ill... *p. 465*

*FULLER-LEHIGH CO., Fullerton, Pa... *p. 92*

Hardinge Conical Mill Co., 120 Broadway, New York

—Cinder

Illinois Mfg. & Supply Co., Quincy, Ill.

Sly Mfg. Co., W. W., Cleveland, O.

Standard Equipment Co., New Haven, Conn.

—Comminuting

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

—Crushing (Sugar Cane)

FULTON IRON WORKS CO., St. Louis, Mo... *p. 24*

Reading Iron Co., Reading, Pa.

—End

CLEVELAND TWIST DRILL CO., Cleveland, O... *p. 378*

Detroit Reamer & Tool Co., 302 Congress St., East, Detroit, Mich.

Gale-Sawyer Co., 33 Wormwood St., Boston, Mass.

—Graphite

Munson Mill Machinery Co., Inc., 405 Broadway, Utica, N. Y.

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

—Pebble

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

Hardinge Conical Mill Co., 120 Broadway, New York

Patterson Foundry & Machine Co., East Liverpool, O.

—Roller

Acton, John, 118 John St., Brooklyn, N. Y.

*FULLER-LEHIGH CO., Fullerton, Pa... *p. 92*

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

—Rubber Working

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

—Sand (Steel Foundry)

FROST MFG. CO., 112 W. Adams St., Chicago, Ill... *pp. 47, 462*

—Shingle

Novelty Iron Works Co., Dyersville, Ia.

—Shredding

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

—Tube

BONNOT CO., Canton, O... *p. 464*

CHALMERS & WILLIAMS, 1450 Arnold St., Chicago Heights, Ill... *p. 465*

MINERAL WOOL

Keasbey Co., Robert A., 445 West St., New York

MINING AND CONCENTRATING MACHINERY

*ALLIS-CHALMERS MFG. CO., Milwaukee, Wis... *p. 15*

Denver Engineering Works Co., Denver, Colo.

*FULLER-LEHIGH CO., Fullerton, Pa... *p. 92*

Ruggles-Coles Engineering Co., 50 Church St., New York

Stearns-Roger Mfg. Co., 1718-1720 California St., Denver, Colo.

MINING MACHINERY

*ALLIS-CHALMERS MFG. CO., Milwaukee, Wis... *p. 15*

Angels Iron Works, Angels Camp, Cal.

Bretting Mfg. Co., C. G., Ashland, Wis.

Castle Engineering Co., Inc., A. M., La Crosse, Wis.

CHALMERS & WILLIAMS, 1450 Arnold St., Chicago Heights, Ill... *p. 465*

Colorado Iron Works Co., Box 989, Denver, Colo.

Diamond Machine Co., Monongahela, Pa.

*FULLER-LEHIGH CO., Fullerton, Pa... *p. 92*

Hendrie & Bolthoff Mfg. & Supply Co., 1635 17th St., Denver, Colo.

Johnson Engineering Works, First National Bank Bldg., Chicago, Ill.

Lake Shore Engine Works, Marquette, Mich.

INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*

Mancha Storage Battery Locomotive Co., 1809 S. Kingshighway, St. Louis, Mo.

Mecklenburg Iron Works, Charlotte, N. C.

Myers-Whaley Co., Knoxville, Tenn.

Nelsonville Foundry & Machine Co., Nelsonville, O.

Price Pump & Engine Co., G. W., 33 Stevenson St., San Francisco, Cal.

*POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md... *pp. 196, 197*

Sturtevant Mill Co., Harrison Sq., Boston, Mass.

United Iron Works Co., Kansas City, Mo.

WELLMAN-SEAVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

MIXERS**—Clay, Fertilizer, Etc.**

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

BLAW-KNOX CO., Pittsburgh, Pa... *p. 489*

Dunning & Boschert Press Co., Inc., 331 West Water St., Syracuse, N. Y.

Lakewood Engineering Co., Berea Road, Cleveland, O.

Ransome Concrete Machinery Co., 115 Broadway, New York

Walker & Ellicott, Wilmington, Del.

*WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill... *pp. 468, 469*

—Concrete

Austin Co., Inc., F. C., 609-80 E. Jackson St., Chicago, Ill.

BLAW-KNOX CO. (Blaw-Ransomixer), Pittsburgh, Pa... *p. 489*

Burrell Mfg. & Supply House, Kankakee, Ill.

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis... *pp. 118, 119*

CONVEYING WEIGHING CO., 90 West St., New York... *p. 251*

Ideal Concrete Machinery Co., Colrairie Ave., Cincinnati, O.

Knickerbocker Co., Jackson, Mich.

Lakewood Engineering Co., Berea Road, Cleveland, Ohio

Ransome Concrete Machinery Co., 115 Broadway, New York

Shannon & Co., J. Jacob, 1744 Market St., Philadelphia, Pa.

Standard Scale & Supply Co., 1631 Liberty Ave., Pittsburgh, Pa.

United Engine Co., Lansing, Mich.

—Rubber Cement

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 490*

—Soap Powder

Dunning & Boschert Press Co., Inc., 331 West Water St., Syracuse, N. Y.

—Steam Jacketed

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

Advertisements of firms marked * appear in The Journal, A. S. M. E.

***CALDWELL & SON CO.**, H. W., 17th St. & Western Ave., Chicago, Ill. . . *p.* 250
DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass. . . *pp.* 44, 45
PHOENIX IRON WORKS CO., Meadville, Pa. . . *p.* 497
Sowers Mfg. Co., 1300 Niagara St., Buffalo, N. Y.

MIXING MACHINERY

BARTLETT & SNOW CO., C. O., Cleveland, O. . . *p.* 249
Day Co., J. H., 1144 Harrison Ave., Cincinnati, O.
Ross & Son Co., Chas., 148-156 Classon Ave., Brooklyn, N. Y.

—Foundry Sand

BARTLETT & SNOW CO., C. O., Cleveland, O. . . *p.* 249
Sand Mixing Machine Co., 52 Vanderbilt Ave., New York
Standard Sand & Machine Co., Cleveland, O.

—Gas and Air

Kemp Mfg. Co., C. M., Baltimore, Md.

MODELS

BURROUGHS CO., CHARLES, Newark, N. J. . . *p.* 454

MOLDING MACHINES

Arcade Mfg. Co., Freeport, Ill.
B & B Mfg. Co. Inc., Indianapolis, Ind.
Berkshire Mfg. Co., Cleveland, O.
Cleveland Osborn Mfg. Co. (Osborn), 5401 Hamilton Ave., Cleveland, O.
Dayton Molding Machine Co., Dayton, O.
Grimes Molding Machine Co., 1218 Hastings St., Detroit, Mich.
Herman Pneumatic Machine Co., Pittsburgh, Pa.
Tabor Mfg. Co., 18th & Hamilton Sts., Philadelphia, Pa.
U. S. Molding Machine Co., 968 E. 69th Place, Cleveland, Ohio
WOODISON CO., E. J., Detroit, Mich. . . *p.* 463

—Hand and Jar Rammed Rollover

Grimes Molding Machine Co., 1218 Hastings St., Detroit, Mich.

MOLDS**—Ingot**

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. . . *p.* 496

—Ingot (With Vacuum Chamber)
Peyton & Hitt, 426 W. 3rd St., Elyria, O.

—Plastic Composition

BURROUGHS CO., CHARLES, Newark, N. J. . . *p.* 454

KELLER MECHANICAL ENGRAVING CO., 68 Washington St., Brooklyn, N. Y. . . *p.* 369

—Rubber

Birch Hintz Mfg. Co., 1100-1110 S. Kilbourn Ave., Chicago, Ill.

Goshen Rubber & Mfg. Co., Goshen, Ind.
HOGGSON & PETTIS MFG. CO., New Haven, Conn. . . *pp.* 394, 395, 396

MONEL METAL

BAYONNE CASTING CO., Bayonne, N. J. . . *p.* 291

Supple-Biddle Hardward Co., 512 Commerce St., Philadelphia, Pa.

MONO-RAIL SYSTEMS

(See Tramrail Systems, Overhead)

MOTION RECORDERS

BRISTOL CO., Waterbury, Conn. . . *p.* 530
***FOXBORO CO., INC.**, Foxboro, Mass. . . *p.* 533

MORTISING MACHINES

Greenlee Bros. & Co., Rockford, Ill.

—Chain Saw

NEW BRITAIN MACHINE CO., New Britain, Conn. . . *p.* 336

MOTOR GENERATORS

Crocker-Wheeler Co., Ampere, N. J.

Cushman Electric Co., 43 S. Main St., Concord, N. H.

Electro-Dynamic Co., Bayonne, N. J.

***GENERAL ELECTRIC CO.**, Schenectady, N. Y. . . *pp.* 20, 21, 521

Langstadt Meyer Co., Appleton, Wis.

Peerless Electric Co., Warren, O.

Ridgway Dynamo & Engine Co., Ridgway, Pa.

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York. . . *p.* 505

***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa. . . *pp.* 114, 115

MOTORS**—Aeronautical**

Duesenberg Motors Corp'n, 120 Broadway, New York

Hall-Scott Motor Car Co., Inc., Crocker Bldg., San Francisco, Cal.

Herschell Spillman Co., North Tonawanda, N. Y.

Roberts Motor Mfg. Co., Sandusky, O.

Thomas-Morse Aircraft Corp'n, Ithaca, N. Y.

Wright-Martin Aircraft Co., New Brunswick, N. J.

—Air and Steam

ROTO CO., Hartford, Conn. . . *p.* 71

Union Machine Co., 183 University Ave., St. Paul, Minn.

—Automobile

Duensenberg Motors Corp'n, 120 Broadway, New York

Elbridge Engine Co., 328 Main St., E., Rochester, N. Y.

Falls Machine Co., Sheboygan Falls, Wis.

Ferro Machine & Foundry Co., Cleveland, O.

Hercules Motor Mfg. Co., Canton, O.

Herschell Spillman Co., North Tonawanda, N. Y.

Light Mfg. & Foundry Co., Pottstown, Pa.

Lycoming Foundry & Machine Co., Williamsport, Pa.

Teetor-Hartley Motor Corp'n, Hagerstown, Md.

***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa. . . *pp.* 114, 115

—Compressed Air

INGERSOLL-RAND CO., 11 Broadway, New York. . . *pp.* 428, 429

WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa. . . *pp.* 432, 433

—Electric

***ALLIS-CHALMERS MFG. CO.**, Milwaukee, Wis. . . *p.* 15

Burke Electric Co., Erie, Pa.

Cline Electric Mfg. Co., Fisher Bldg., Chicago, Ill.

C & C Electric & Mfg. Co., Garwood, N. J.

Clark, Jr., Electric Co., Jas., 520 W. Main St., Louisville, Ky.

Colonial Fan & Motor Co., Warren, O.

Crocker-Wheeler Co., Ampere, N. J.

Cushman-Electric Co., 43 S. Main St., Concord, N. H.

Diehl Mfg. Co., Elizabethport, N. J.

Diennet & Eisenhardt, Inc., 1304 N. Howard St., Philadelphia, Pa.

Eck Dynamo & Motor Co., Belleville, N. J.

Electric Machinery Co., Minneapolis, Minn.

Electro-Dynamic Co., Bayonne, N. J.

Fidelity Electric Co., Lancaster, Pa.

***GENERAL ELECTRIC CO.**, Schenectady, N. Y. . . *pp.* 20, 21, 521

Holt Electric Co., 377-379 S. Pierce St., Milwaukee, Wis.

Janette Mfg. Co., 625 W. Jackson Blvd., Chicago, Ill.

Norton Machine Works, Elmira, N. Y.

Ideal Electric & Mfg. Co., Mansfield, O.

Kester Electric Co., Terre Haute, Ind.

Kimble Electric Co., 634 N. Western Ave., Chicago, Ill.

Lincoln Electric Co., Kelly Ave. & 38th St., Cleveland, O.

Mechanical Appliance Co., Milwaukee, Wis.

Peerless Electric Co., Warren, O.

Mot

MOTORS (Continued)

—Electric

Phoenix Electric Co., Mansfield, O.
 Reliance Electric & Engineering Co., 1088
 Ivanhoe Road, Cleveland, O.
 Robbins & Myers Co., Springfield, O.
 Rochester Motors Co., Inc., Rochester, N. Y.
 Roth Bros. & Co., 1400 W. Adams St., Chicago,
 Ill.
 Stow Mfg. Co., 443 State St., Binghamton,
 N. Y.
 STURTEVANT CO., B. F., Hyde Park, Boston,
 Mass... pp. 74, 75
 Temco Electric Motor Co., 66 Sugar St., Leipsic,
 O.
 Wagner Electric Mfg. Co., 6400 Plymouth Ave.,
 St. Louis, Mo.
 Western Electric Co., Inc., 195 Broadway, New
 York
 *WESTINGHOUSE ELECTRIC & MFG. CO.,
 East Pittsburgh, Pa... pp. 114, 115
 WISCONSIN ELECTRIC CO., Racine, Wis.
 ... p. 371

—Electric (Slow & Variable Speed)

Electro-Dynamic Co., Bayonne, N. J.
 *GENERAL ELECTRIC CO., Schenectady,
 N. Y... pp. 20, 21, 521
 Jantz & Leist Electric Co., Cincinnati, O.
 *WESTINGHOUSE ELECTRIC & MFG. CO.,
 East Pittsburgh, Pa... pp. 114, 115

—Water

Backus Water Motor Co., 172-182 Pennsylvania
 Ave., Newark, N. J.

MUCKING MACHINERY

Lake Shore Engine Works, Marquette, Mich.

MUFFLERS

Maxim Silencer Co., Hartford, Conn.

MUNITION MACHINERY

Bryant Co., 58th & Filmore Sts., Chicago, Ill.

MUNITIONS

Bartlett Hayward Co., Baltimore, Md.
 BLISS CO., E. W., 19 Adams St., Brooklyn,
 N. Y... pp. 310, 311
 Brown Bag Filling Machine Co., 20 Main St.,
 Fitchburg, Mass.
 Plumb, Fayette R., Bridesburg, P. O., Phila-
 delphia, Pa.
 *POOLE ENGINEERING & MACHINE CO.,
 Woodberry, Baltimore, Md... pp. 196, 197
 *WESTINGHOUSE ELECTRIC & MFG. CO.,
 East Pittsburgh, Pa... pp. 114, 115
 Winchester Repeating Arms Co., New Haven,
 Conn.

N

NAIL MACHINERY

SLEEPER & HARTLEY, INC., Worcester,
 Mass... p. 486

NIPPLE THREADING MACHINES

LANDIS MACHINE CO., INC., Waynesboro,
 Pa... pp. 372, 373
 Merrell Mfg. Co., 845 Curtis St., Toledo, O.

NITROGEN GAS

Air Reduction Sales Co., 120 Broadway, New
 York
 Linde Air Products Co., 30 E. 42nd St., New
 York

NOTCHING MACHINES

TOLEDO MACHINE & TOOL CO., Toledo,
 O... p. 313

—Angle

Kidder Mfg. Co., J. F., Burlington, Vt.
 NILES-BEMENT-POND CO., 111 Broadway,
 New York... p. 344

—Armature Disc

BLISS CO., E. W., 19 Adams St., Brooklyn,
 N. Y... pp. 310, 311
 LONG & ALLSTATTER CO., Hamilton, O...
 p. 309

NILES-BEMENT-POND CO., 111 Broadway,
 New York... p. 344

TOLEDO MACHINE & TOOL CO., Toledo,
 O... p. 313

NOZZLES

—Aerating

ANTHONY CO., 138 West Ave., Long Island
 City, N. Y... p. 410

—Fire

*CRANE CO., 836 S. Michigan Ave., Chicago,
 Ill... pp. 120, 121, 122, 123

KELLY & JONES CO., Greensburg, Pa... pp.
 130, 131

Morse & Son, Inc., Andrew J., 221 High St.,
 Boston, Mass.

—Graphite

Seidel, Inc., R. B., 1322 Callowhill St., Phila-
 delphia, Pa.

—Spray

ANTHONY CO., 138 West St., Long Island
 City, N. Y... p. 410

Cooling Tower Co., 15 John St., New York
 Kauffman Engineering Co., 3951-53 LaCade
 Ave., St. Louis, Mo.

KELLY & JONES CO., Greensburg, Pa... pp.
 130, 131

Monarch Mfg. Works, 3130 Emery St., Phila-
 delphia, Pa.

*SPRAY ENGINEERING CO., 93 Federal St.,
 Boston, Mass... p. 113

Star Brass Works, 3114-20 Carroll Ave., Chicago,
 Ill.

*YARNALL-WARING CO. (Yarway), Chestnut
 Hill, 7603-20 Queen St., Philadelphia, Pa... p.
 139

NUT LOCKS

National Lock Washer Co., Newark, N. J.

Positive Lock Washer Co., Newark, N. J.

NUT MACHINES (Hot Pressed)

Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland,
 O.

NUTS

Bayonne Bolt & Nut Co., Bayonne, N. J.

Bethlehem Steel Co., South Bethlehem, Pa.

Brightman Mfg. Co., So. Columbus, O.

Clark Bros. Bolt Co., Milldale, Conn.

STANDARD SHOP EQUIPMENT CO., 1413
 Somerset St., Philadelphia, Pa... p. 384

Tock Screw Machine Products Corp'n, 199
 Eighth St., Long Island City, N. Y.

U. S. Automatic Co., Amherst, O.

—Case Hardened

RUSSELL, BURDSALL & WARD BOLT &
 NUT CO. (Empire), Port Chester, N. Y... p.
 407

—Castellated

CINCINNATI SCREW CO., Twilight, O.
 (Cincinnati Suburb)... p. 402

CORBIN SCREW CORP'N, New Britain,
 Conn... p. 403

MILTON MFG. CO., Milton, Pa... p. 406

Nelson Mfg. Co., A., 564 W. Randolph St.,
 Chicago, Ill.

New Haven Screw Co., 191 Foster St., New
 Haven, Conn.

Peninsular Milled Screw Co., 1090 Lafayette
 E., Detroit, Mich.

Perry-Fay Co., Elyria, O.

RUSSELL, BURDSALL & WARD BOLT &
 NUT CO. (Empire), Port Chester, N. Y... p.
 407

Western Automatic Machine Screw Co., Elyria,
 O.

—Cold Punched

Columbia Nut & Bolt Co., Inc., Bridgeport,
 Conn.

COLUMBUS BOLT WORKS CO., Columbus,
 O... p. 405

CORBIN SCREW CORP'N, New Britain,
 Conn... p. 403

Falls Rivet Co., Kent, O.

Garland Nut & Rivet Co., West Pittsburgh,
 Lawrence Co., Pa.

Mot

MILTON MFG. CO., Milton, Pa...*p. 406*
 National Bolt & Nut Co., 62nd St. & A. V. R. R.,
 Pittsburgh, Pa.
 RUSSELL, BURDSALL & WARD BOLT &
 NUT CO. (Empire), Port Chester, N. Y...*p. 407*

—Hot Pressed

COLUMBUS BOLT WORKS CO., Columbus,
 O...*p. 405*
 CORBIN SCREW CORP'N, New Britain,
 Conn...*p. 403*
 National Bolt & Nut Co., 62nd St. & A. V. R. R.,
 Pittsburgh, Pa.
 MILTON MFG. CO., Milton, Pa...*p. 406*
 RUSSELL, BURDSALL & WARD BOLT &
 NUT CO. (Empire), Port Chester, N. Y...*p. 407*

Upson Nut Co., Scranton Rd., Cleveland, O.
 Victor Tool Co., Waynesboro, Pa.

—Lock

Columbia Nut & Bolt Co., Inc. (Columbia,
 Gibb), Bridgeport, Conn.
 MARK MFG. CO., P. O. Box G, Chicago, Ill.
 ...*p. 160*

Semi-Finished

CINCINNATI SCREW CO., Twilight, O.
 (Cincinnati Suburb)...*p. 402*
 Columbia Nut & Bolt Co., Inc., Bridgeport,
 Conn.
 CORBIN SCREW CORP'N, New Britain,
 Conn...*p. 403*

MILTON MFG. CO., Milton, Pa...*p. 406*
 Peninsular Milled Screw Co., 1090 Lafayette
 E., Detroit, Mich.

Rhode Island Tool Co., 148 West River St.,
 Providence, R. I.

RUSSELL, BURDSALL & WARD BOLT &
 NUT CO. (Empire), Port Chester, N. Y...*p. 407*

Sherman Klove Co., 4519 W. Harrison St.,
 Chicago, Ill.

St. Louis Screw Co., St. Louis, Mo.

—Thumb

WILLIAMS & CO., J. H., 70 Richards St.,
 Brooklyn, N. Y...*p. 397*

O

OHMMETERS

BIDDLE, JAMES G., 1211-1213 Arch St.,
 Philadelphia, Pa...*p. 539*

*GENERAL ELECTRIC CO., Schenectady,
 N. Y...*pp. 20, 21, 521*

Leeds & Northrup Co., 4901 Stenton Ave., Phila-
 delphia, Pa.

Thompson-Levering Co., 325 Arch St., Phila-
 delphia, Pa.

*WESTINGHOUSE ELECTRIC & MFG. CO.,
 East Pittsburgh, Pa...*pp. 114, 115*

*WESTON ELECTRICAL INSTRUMENT
 CO., 49 Weston Ave., Waverly Park, Newark,
 N. J...*p. 537*

OIL AND GREASE CUPS

ALBANY LUBRICATING CO., 706-10 Wash-
 ington St., New York...*p. 173*

AMERICAN INJECTOR CO., Detroit, Mich.
 ...*p. 151*

American Specialty Co., 29 E. Madison St.,
 Chicago, Ill.

Bowen Products Corp'n, Auburn, N. Y.

BUCKEYE IRON & BRASS WORKS, Dayton,
 O...*p. 481*

*CRANE CO., 836 South Michigan Ave.,
 Chicago, Ill...*pp. 120, 121, 122, 123*

Crescent Mfg. Co., Scottdale, Pa.

DETROIT LUBRICATOR CO., Detroit,
 Mich...*p. 167*

Engineering Supply Co., 2238 N. 9th St., Phila-
 delphia, Pa.

Essex Brass Co., G. B., Detroit, Mich.

Hamilton & DeLoss, Bridgeport, Conn.

Hunter Pressed Steel Co. (Airspring), Lansdale,
 Pa.

Keystone Lubricating Co., 21st, Clearfield &
 Lippincott Sts., Philadelphia, Pa.

LONERGAN CO., J. E., 211-215 Race St.,
 Philadelphia, Pa...*pp. 127, 528*

Lunkenheimer Co., Cincinnati, O.

Merchant & Evans Co., 2019-2035 Washington
 Ave., Philadelphia, Pa.

PENBERTHY INJECTOR CO., Detroit, Mich.
 ...*pp. 152, 153*

Powell Co., William, Cincinnati, O.

RICHARDSON-PHENIX CO., 126 Reservoir
 Ave., Milwaukee, Wis...*pp. 170, 171*

Sherwood Mfg. Co., 1702-1712 Elmwood Ave.,
 Buffalo, N. Y.

Swain Lubricator Co., 443 W. 37th St., Chicago,
 Ill.

Tucker, W. R. & C. F., Hartford, Conn.

Wahlstrom Tool Co., 5520 2nd Ave., Brooklyn,
 N. Y.

**OIL BURNERS, ENGINES, FILTERS,
 PUMPS, ETC.**

(See Burners, Engines, Filters, Pumps, etc., Oil)

OIL BURNING EQUIPMENT

ANTHONY CO., 138 West Ave., Long Island
 City, N. Y...*p. 410*

*BEST, INC., W. N., 11 Broadway, New York
 ...*p. 411*

*CASEY-HEDGES CO., Chattanooga, Tenn.
 ...*pp. 42, 43*

Fess System Co., 220 Natoma St., San Fran-
 cisco, Cal.

Gilbert & Barker Mfg. Co., Springfield, Mass.

GWYNN ENGRG. CO., 100-108 Liberty Ave.,
 Pittsburgh, Pa...*p. 412*

HAMMEL OIL BURNING EQUIPMENT
 CO., 409 Pine St., Providence, R. I...*p. 95*

IDEAL AUTOMATIC GOVERNOR CO., 164
 Emmet St., Newark, N. J...*p. 145*

Johnson Co., S. T., 1337 Mission St., San Fran-
 cisco, Cal.

Lockett & Co., Ltd., A. M., New Orleans, La.

Mirco Fuel Oil Equipment Co., Lancaster, Pa.

National Supply Co., 416 W. Grand Ave.,
 Chicago, Ill.

Production Engineering Co., 1716 Spring Garden
 St., Philadelphia, Pa.

ROCKWELL CO., W. S., 50 Church St., New
 York...*p. 413*

TATE-JONES & CO., INC., Pittsburgh, Pa...
 ...*pp. 416, 417*

VOGT MACHINE CO., HENRY, Louisville,
 Ky...*p. 63*

OIL CLOTH PRINTING MACHINERY

Dienelt & Eisenhardt, Inc., 1304 N. Howard St.,
 Philadelphia, Pa.

OIL FILTERING SYSTEMS

Famous Filter Co., 310 N. Commercial St.,
 St. Louis, Mo.

RICHARDSON-PHENIX CO., 126 Reservoir
 Ave., Milwaukee, Wis...*pp. 170, 171*

OIL MILL MACHINERY

Bauer Bros. Co., Springfield, O.

BUCKEYE IRON & BRASS WORKS, Dayton,
 O...*p. 481*

Callahan Co., W. P., Dayton, O.

Carver Cotton Gin Co., East Bridgewater,
 Mass.

Chickasaw Machine & Foundry Co., Memphis,
 Tenn.

Sprout, Waldron & Co., Muncy, Pa.

—Cotton Seed

PLATT IRON WORKS, Dayton, O...*p. 446*

OIL RECLAIMERS

*DE LA VERGNE MACHINE CO., 1123 E.
 138th St., New York...*p. 28*

RICHARDSON-PHENIX CO., 126 Reservoir
 Ave., Milwaukee, Wis...*pp. 170, 171*

OIL REFINERY EQUIPMENT

Graver Tank Works, Wm., 28 E. Jackson Blvd.,
 Chicago, Ill.

National Supply Co., 136 Huron St., Toledo, O.

Reeves Bros. Co., Box K, Alliance, O.

Reid Gas Engine Co., Joseph, Oil City, Pa.

Oil

OIL REFINERY EQUIPMENT (Continued)

Standard Boiler & Plate Iron Co., Niles, O.
United Iron Works Co., Kansas City, Mo.

OIL SEPARATING MACHINES (Centrifugal)

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 490*

DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*

D'Olier Centrifugal Pump & Machine Co., Morris Bldg., Philadelphia, Pa.

National Separator & Machine Co., 89 State St., Boston, Mass.

OIL & WASTE SAVING MACHINE CO., 1509 Real Estate Trust Bldg., Philadelphia, Pa... *p. 419*

OIL STORAGE OUTFITS

Atlantic Refining Co., 3144 Passyunk Ave., Philadelphia, Pa.

Kupferle Bros. Mfg. Co., 600 N. Second St., St. Louis, Mo.

PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

OIL STORAGE SYSTEMS

American Oil Pump & Tank Co., Findley & Dalton Sts., Cincinnati, O.

Bowser & Co., Inc., S. F., Ft. Wayne, Ind. Production Engineering Co., 1716 Spring Garden St., Philadelphia, Pa.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

Wayne Oil Tank & Pump Co., Canal St., Ft. Wayne, Ind.

OIL TESTING APPARATUS

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... *p. 535*

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

OIL TESTING MACHINES

OLSEN TESTING MACHINE CO., TINIUS, 500 N. 12th St., Philadelphia, Pa... *p. 511*

RIEHLER BROS. TESTING MACHINE CO., 1424 N. 9th St., Philadelphia, Pa... *p. 512*

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

OIL WELL MACHINERY

Bessemer Gas Engine Co., Grove City, Pa. Lucey Mfg. Corp'n, Woolworth Bldg., New York

National Supply Co., 136 Huron St., Toledo, O.

Oil Well Supply Co., 213-215 Water St., Pittsburgh, Pa.

Reid Gas Engine Co., Joseph, Oil City, Pa. Union Tool Co., Torrance, Cal.

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York... *pp. 30, 117, 431, 447*

OIL WELL SUPPLIES

Bradford Motor Works, Bradford, Pa. DARLING PUMP & MFG. CO., LTD., Wilhamsport, Pa... *p. 124*

Layne & Bowler Co., 6th & Girard Sts., Houston, Texas

McEwen Brothers, Wellsville, N. Y. MARK MFG. CO., P. O. Box G, Chicago, Ill... *p. 160*

National Supply Co., 136 Huron St., Toledo, O.

Oil Well Supply Co., 213-215 Water St., Pittsburgh, Pa.

OILING DEVICES

AMERICAN INJECTOR CO., Detroit, Mich... *p. 151*

DETROIT LUBRICATOR CO., Detroit, Mich... *p. 167*

*GREENE-TWEED & CO., 109 Duane St., New York... *p. 168*

Inter-State Machine Products Co., Rochester, N. Y.

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... *pp. 127, 528*

McCORD MFG. CO., Detroit, Mich... *p. 169*

McCullough Mfg. Co., Minneapolis, Minn. Manzel Bros. Co., 317 Babcock St., Buffalo, N. Y.

Nathan Mfg. Co., Lawrence & Amity Sts., Flushing, Long Island, N. Y.

Nugent & Co., Wm. W., 146-148 W. Superior St., Chicago, Ill.

Rich Mfg. Co., 370 Atlantic Ave., Boston, Mass. RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

OILING SYSTEMS

Famous Filter Co., 310 N. Commercial St., St. Louis, Mo.

McCORD MFG. CO., Detroit, Mich... *p. 169*

Nugent & Co., Wm. W., 146-148 W. Superior St., Chicago, Ill.

Power Plant Specialties, 219 Ruffner St., Lockland, O.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

OILS**—Core**

SWAN & FINCH CO. (Corul), 165 Broadway, New York... *p. 174*

—Cutting

(See Compounds, Cutting)

—Fuel

American Oil Products Co., 1426 Seneca St., Buffalo, N. Y.

Indian Refining Co., Inc., 244 Madison Ave., New York

Lynch-Clarisey Co., 3211-3213 S. Wood St., Chicago, Ill.

Robinson & Son Co., Wm. C., 32 South St., Baltimore, Md.

*THE TEXAS COMPANY (Texaco), 17 Battery Place, New York... *p. 175*

TIDE WATER OIL CO., 11 Broadway, New York... *p. 176*

White Star Refining Co., 614 Avery Ave., Detroit, Mich.

—Lubricating

ALBANY LUBRICATING CO., 708-10 Washington St., New York... *p. 173*

Black Bear Co., 138-144 Temple St., Long Island City, N. Y.

Borne, Scrymser Co., 80 South St., New York. Dexter Oil Co., 313 Sixth Ave., Pittsburgh, Pa.

Eagle Oil & Supply Co. (Eagleine), 44-45-46 India St., Boston, Mass.

Gearhart Oil Burner Co., 1314 Eye St., Fresno, Cal.

Houghton & Co., E. F., 240 W. Somerset St., Philadelphia, Pa.

Kramer Oil Co., W. J., 214-216 Reed St., Milwaukee, Wis.

Lynch-Clarisey Co., 3211-3213 S. Wood St., Chicago, Ill.

Metalene Chemical Co., Cleveland, O. Monarch Mfg. Co., Toledo, O.

New York Lubricating Oil Co., 116 Broad St., New York City

New York & New Jersey Lubricant Co., 165 Broadway, New York

O'Brien-Northrop Oil & Chem. Co., St. Louis, Mo.

Penn Oil & Supply Co., Oil City, Pa. Petroleum Refining Co., 1502 Carter Bldg., Houston, Tex.

Standard Oil Co., Chicago, Ill. Standard Oil Co. of New York, 26 Broadway, New York

Star Oil Co., 440 N. Halsted St., Chicago, Ill. Stuart & Co., D. A., 350-360 E. Illinois St., Chicago, Ill.

SWAN & FINCH CO. (Atlas), 165 Broadway, New York... *p. 174*

Symonds Co., Joseph H., Melrose, Mass.

*THE TEXAS COMPANY (Texaco), 17 Battery Place, New York... *p. 175*

TIDE WATER OIL CO. (Veedol), 11 Broadway, New York... *p. 176*

Vacuum Oil Co. (Gargoyle), 61 Broadway, New York

Valvoline Oil Co., 11 Broadway, New York
 Waverly Oil Works Co., 54th St., Pittsburgh, Pa.
 White & Bagley Co., 100 Foster St., Worcester, Mass.
 Wolverine Lubricants Co. of N. Y., 80 Broad St., New York

OPERATION RECORDERS

BRISTOL CO., Waterbury, Conn... *p. 530*
 *FOXBORO CO., INC., Foxboro, Mass... *p. 533*

SLOCUM, AVRAM & SLOCUM LABORATORIES, INC., 531-537 W. 21st St., New York... *p. 538*

Thwing Instrument Co., 3339 Lancaster Ave., Philadelphia, Pa.

OPTICAL PYROMETERS

(See Pyrometers, Optical)

ORE HANDLING MACHINERY

Andresen-Evans Co., 646 Railway Exchange Bldg., Chicago, Ill.

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

BLAW-KNOX CO., Pittsburgh, Pa... *p. 489*

*BROWN HOISTING MACHINERY CO., Cleveland, O... *p. 265*

Dominion Bridge Co., Ltd., Montreal, P. Q., Canada

Hoover & Mason, 1407 Railway Exchange, Chicago, Ill.

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y... *pp. 252, 253*

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*

Mead-Morrison Mfg. Co., Prescott & Orleans Sts., East Boston, Mass.

ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p. 257*

Stephens-Adamson Mfg. Co., Aurora, Ill.

Toledo Bridge & Crane Co., Toledo, O.

WELLMAN-SEAEVER-MORGAN CO., 7000 Central Ave., Cleveland, O... *p. 272*

ORE JIGS

McLanahan-Stone Machine Co., Hollidaysburg, Pa.

ORE WASHING MACHINERY

Davis Foundry & Machine Works, Rome, Ga.

McLanahan-Stone Machine Co., Hollidaysburg, Pa.

ORNAMENTAL WORK**—Brass**

Newman Mfg. Co., 717 Sycamore St., Cincinnati, O.

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York... *p. 505*

WRIGHT WIRE CO., Worcester, Mass... *p. 282*

—Iron and Bronze

Bolles Iron & Wire Works, J. E., 53 Porter St., Detroit, Mich.

Buffalo Wire Works Co., Buffalo, N. Y.

Kamman Mfg. Co., Walter, 3264 Spring Grove Ave., Cincinnati, O.

Schreiber & Sons Co., L., P. O. Box 18, Evanston Sta., Cincinnati, O.

Smith-Rhea Co., Baltimore, Md.

WRIGHT WIRE CO., Worcester, Mass... *p. 282*

OVENS

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 494*

—Convayor

Oven Equipment & Mfg. Co., New Haven, Conn.

—Core

Foundry Equipment Co., 1831 Columbus Road, Cleveland, O.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 494*

Monarch Engineering & Mfg. Co., Baltimore, Md.

Moyer, Albert W., Singer Bldg., New York

Sly Mfg. Co., W. W., Cleveland, O.

Steiner & Co., E. E., 117-119 N. J. R. R. Ave., Newark, N. J.

Young Brothers Co., 320 Franklin St., Detroit, Mich.

—Enameling

Steiner & Co., E. E., 117-119 N. J. R. R. Ave., Newark, N. J.

Young Brothers Co., 320 Franklin St., Detroit, Mich.

—Japanning

Detroit Heating & Lighting Co., Lieb & Wight Sts., Detroit, Mich.

Steiner & Co., E. E., 117-119 N. J. R. R. Ave., Newark, N. J.

Young Bros. Co., 320 Franklin St., Detroit, Mich.

—Sectional

Oven Equipment & Mfg. Co., New Haven, Conn.

—Sherardising (Electric)

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*

OVERHAULING MACHINES

*POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md... *pp. 196, 197*

TORRINGTON MFG. CO., Torrington, Conn... *p. 483*

OVERHEAD TRACK SYSTEMS

(See Tramrail Systems, Overhead)

OXY-ACETYLENE APPARATUS

Air Reduction Sales Co., 120 Broadway, New York

Davis-Bournonville Co., Jersey City, N. J.

Henderson-Willis Welding & Cutting Co., 2305-07-09 N. 11th St., St. Louis, Mo.

K-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York... *p. 419*

MILBURN CO., ALEXANDER, Baltimore, Md... *p. 420*

Modern Engineering Co., 23rd & Walnut Sts., St. Louis, Mo.

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J... *p. 421*

Waterhouse Welding Co., 2 Pelham St., Boston, Mass.

OXY-ACETYLENE SUPPLIES

K-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York... *p. 419*

Linde Air Products Co., 30 E. 42nd St., New York

Modern Engineering Co., 23rd & Walnut Sts., St. Louis, Mo.

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J... *p. 421*

Waterhouse Welding Co., 2 Pelham St., Boston, Mass.

OXY-ACETYLENE WELDING

(See Welding, Oxy-Acetylene)

OXYGEN GAS

Air Reduction Sales Co., 120 Broadway, New York

Burdett Mfg. Co., 309 St. Johns Court, Chicago, Ill.

K-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York... *p. 419*

International Oxygen Co., 115 Broadway, New York

Linde Air Products Co., 30 E. 42nd St., New York

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York... *p. 505*

P**PACKING****—Ammonia**

American Huhn Metallic Packing Co., Woolworth Bldg., New York

American Metallic Packing Co., 3621-23-25 Mexico Ave., North Side, Pittsburgh, Pa.

See Catalogue Section of Arms listed in capital type

PACKING (Continued)**—Ammonia**

Brandt, Randolph, 70 Cortlandt St., New York
 Buhne Metal Packing Co., 93 Nassau St., New York
 Clark Flexible Metallic Packing Co., 71 Kennebec St., Portland, Me.
 Crandall Packing Co., Palmyra, N. Y.
 CRANE PACKING CO., 9 S. Clinton St., Chicago, Ill. . . . *p. 178*
 *DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York . . . *p. 28*
 Eureka Packing Co., 77 Murray St., New York
 Federal Metallic Packing Co., 48 Hanover St., Boston, Mass.
 FRANCE PACKING CO., Tacony, Philadelphia, Pa. . . . *p. 179*
 Gould Packing Co., East Cambridge, Mass.
 GRATON & KNIGHT MFG. CO., Worcester, Mass. . . . *p. 237*
 Harper Mfg. Co., Chester, Pa.
 Hart Packing Co., 144 High St., Boston, Mass.
 Ideal Metallic Packing Co., South Stillwater, Minn.
 *JENKINS BROS., 80 White St., New York . . . *pp. 128, 129*
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York . . . *p. 162*
 Johnson Co., Henry, Gates Ave. & Blvd., Jersey City, N. J.
 Paine Metallic Packing Co., Shawanese, Pa.
 VOGT MACHINE CO., HENRY, Louisville, Ky. . . . *p. 63*
 WALKER & CO., LTD., JAMES, 27 Thames St., New York . . . *p. 182*

—Asbestos

Advance Packing & Supply Co. (Tenax), 11 N. Franklin St., Chicago, Ill.
 Asbestos & Rubber Works of America, 1784 Broadway, New York
 Aycock Co., R. V., 1702 Grand Ave., Kansas City, Mo.
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . . *pp. 120, 121, 122, 123*
 Danubil Co., 253 Broadway, New York
 Dominion Asbestos & Rubber Corp'n, 154 Nassau St., New York
 Federal Asbestos Co., Paterson, N. J.
 FRANKLIN MFG. CO., Franklin, Pa. . . . *pp. 164, 165*
 Gould Packing Co., East Cambridge, Mass.
 *GREENE, TWEED & CO., 109 Duane St., New York . . . *p. 168*
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York . . . *p. 162*
 Johns-Pratt Co. (Vulcabeston), 555 Capitol Ave., Hartford, Conn.
 Keasbey Co., Robert A., 445 West St., New York
 Knowlton Rubber Co., G. W., 60 Pearl St., Boston, Mass.
 Maguire Rubber Co., 30 Church St., New York
 New Jersey Asbestos Co., Camden, N. J.
 Steam Equipment Mfg. Co., 8077 Jenkins Arcade Bldg., Pittsburgh, Pa.
 WALKER & CO., LTD., JAMES, 27 Thames St., New York . . . *p. 182*

—Asbestos & Rubber

Adkins, Young & Allen Co., 561 W. Washington Blvd., Chicago, Ill.
 Cincinnati Rubber Mfg. Co., Cincinnati, Ohio
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . . *pp. 120, 121, 122, 123*
 General Asbestos & Rubber Co., Charleston, S. C.
 GOODRICH RUBBER CO., B. F., Akron, O. . . . *pp. 183, 242*
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York . . . *p. 162*
 WALKER & CO., LTD., JAMES, 27 Thames St., New York . . . *p. 182*

—Benzol

Fibre Finishing Co. (Vellumoid), 27 State St., Boston, Mass.

—Fibre

AMERICAN VULCANIZED FIBRE CO., Wilmington, Del. . . . *p. 296*
 *DIAMOND STATE FIBRE CO., Bridgeport, Pa. . . . *p. 298*
 Durable Mfg. Co., 114 Liberty St., New York
 Endura Mfg. Co., 63rd & Eastwick Ave., Philadelphia, Pa.
 Fibre Finishing Co. (Vellumoid), 27 State St., Boston, Mass.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York . . . *p. 162*
 WALKER & CO., LTD., JAMES, 27 Thames St., New York . . . *p. 182*

—Gasoline

CRANE PACKING CO., 9 S. Clinton St., Chicago, Ill. . . . *p. 178*
 Fibre Finishing Co. (Vellumoid), 27 State St., Boston, Mass.

—Hydraulic

Belmont Packing & Rubber Co., 133 N. Second St., Philadelphia, Pa.
 Brandt, Randolph, 70 Cortlandt St., New York
 Buhne Metal Packing Co., 93 Nassau St., New York
 BURROUGHS CO., CHARLES, Newark, N. J. . . . *p. 454*
 Canco Mfg. Co., Bridge & Garden Sts., Bridgeburg, Philadelphia, Pa.
 Cook Belting Co., H. N. (Golden State), 401 Howard St., San Francisco, Cal.
 Crandall Packing Co., Palmyra, N. Y.
 CRANE PACKING CO., 9 S. Clinton St., Chicago, Ill. . . . *p. 178*
 Detroit Leather Specialty Co., Inc., 90 Beecher Ave., Detroit, Mich.
 Dominion Asbestos & Rubber Corp'n, 154 Nassau St., New York
 Eastern Machinery & Equipment Co., Inc., 1036 Commercial Trust Bldg., Philadelphia, Pa.
 Excelsior Valve Co., 106-108 Fulton St., New York
 Garlock Packing Co., Palmyra, N. Y.
 GOODRICH RUBBER CO., B. F., Akron, O. . . . *pp. 183, 242*
 GRATON & KNIGHT MFG. CO., Worcester, Mass. . . . *p. 237*
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York . . . *p. 162*
 MacWatty Belting Co. (Black Diamond), 7 Beverly St., Providence, R. I.
 Mabbs Hydraulic Packing Co., 431 S. Dearborn St., Chicago, Ill.
 NEW YORK RUBBER CO., 34 Reade St., New York . . . *pp. 244, 245*
 Pacific Coast Rubber & Supply Co., 316 Mission St., San Francisco, Cal.
 Steel Mill Packing Co., 32 W. Larned St., Detroit, Mich.
 WALKER & CO., LTD., JAMES, 27 Thames St., New York . . . *p. 182*
 Walker's Sons & Co., Chas. W., 288 Market St., Newark, N. J.
 Walsh Packing Co., 304 New St., Philadelphia, Pa.
 WATSON-STILLMAN CO., 35 Church St., New York . . . *p. 457*
 Watt's Sons, John M., 54 N. Second St., Philadelphia, Pa.

—Leather
 Chicago Belting Co., 113 N. Green St., Chicago, Ill.
 Coe & Brown Co., New Haven, Conn.
 Detroit Leather Specialty Co., Inc., 90 Beecher Ave., Detroit, Mich.
 GRATON & KNIGHT MFG. CO., Worcester, Mass. . . . *p. 237*
 MARK MFG. CO., P. O. Box G, Chicago, Ill. . . . *p. 160*
 Michigan Leather Packing Co., Inc., Detroit, Mich.
 WALKER & CO., LTD., JAMES, 27 Thames St., New York . . . *p. 182*

Pac

—Metallic

ALLAN & SON, A., Harrison, N. J... *pp. 286, 287*
 American Huhn Metallic Packing Co., Woolworth Bldg., New York
 American Metallic Packing Co., 3621-23-25 Mexico Ave., North Side, Pittsburgh, Pa.
 Buhne Metal Packing Co., 93 Nassau St., New York
 Clark Flexible Metallic Packing Co., 71 Kennebec St., Portland, Me.
 Collins Metallic Packing Co. (Collins), 56-58 N. Second St., Philadelphia, Pa.
 Comee Metallic Packing Co., Stevens Point, Wis.
 CRANE PACKING CO., 9 S. Clinton St., Chicago, Ill... *p. 178*
 Cunningham Metallic Packing Co., Kingsbridge, New York, N. Y.
 Federal Metallic Packing Co. (Federalite), 48 Hanover St., Boston, Mass.
 FRANCE PACKING CO., Tacony, Philadelphia, Pa... *p. 179*
 *GOETZE GASKET & PACKING CO., 22 Allen Ave., New Brunswick, N. J... *p. 180*
 Harper Mfg. Co., Chester, Pa.
 High-Speed Metallic Packing Co., 305 N. Michigan Ave., Chicago, Ill.
 Holmes Metallic Packing Co., Wilkes-Barre, Pa.
 Ideal Metallic Packing Co., South Stillwater, Minn.
 Jerome-Edwards Metallic Packing Co., 320 N. May St., Chicago, Ill.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*
 Katzenstein & Co., L., 358 West St., New York
 Larkins Metallic Packing Co., 404 Duquesne Way, Pittsburgh, Pa.
 Lubricating Metal Co., 2 Rector St., New York
 Martell Packings Co., Elyria, O.
 National Metallic Packing Co., Oberlin, O.
 Paine Metallic Packing Co., Shawanese, Pa.
 Roybel Packing Co., 30 Church St., New York
 Steel Mill Packing Co., 43 W. Larned St., Detroit, Mich.
 Swain Lubricator Co., 443 W. 37th St., Chicago, Ill.
 U. S. Flexible Metallic Tubing Co., Cor. Boyd & Omar Sts., Los Angeles, Cal.
 UNITED STATES METALLIC PACKING CO., 321 N. 13th St., Philadelphia, Pa... *p. 181*
 WALKER & CO., LTD., JAMES, 27 Thames St., New York... *p. 182*
 Walker & Sons, Thomas, 4617-4621 Tacony St., Frankford, Philadelphia, Pa.
—Oil
 CRANE PACKING CO., 9 S. Clinton St., Chicago, Ill... *p. 178*
 Fibre Finishing Co. (Vellumoid), 27 State St., Boston, Mass.
—Rawhide
 Cook Belting Co., H. N., 401 Howard St., San Francisco, Cal.
 Mabbs Hydraulic Packing Co., 431 S. Dearborn St., Chicago, Ill.
 WALKER & CO., LTD., JAMES, 27 Thames St., New York... *p. 182*
—Rod (Piston and Valve)
 American Huhn Metallic Packing Co., Woolworth Bldg., New York
 American Metallic Packing Co., North Side, Pittsburgh, Pa.
 Belmont Packing & Rubber Co., 133 N. Second St., Philadelphia, Pa.
 Brandt, Randolph, 70 Cortlandt St., New York
 Cancoes Mfg. Co., Bridge & Garden Sts., Bridesburg, Philadelphia, Pa.
 Chesterton Co., A. W., 64 India St., Boston, Mass.

Clark Flexible Metallic Packing Co., 71 Kennebec St., Portland, Me.
 Comee Metallic Packing Co., Stevens Point, Wis.
 Cook Belting Co., H. N., 401 Howard St., San Francisco, Cal.
 Crandall Packing Co., Palmyra, N. Y.
 CRANE PACKING CO., 9 S. Clinton St., Chicago, Ill... *p. 178*
 Crown Mfg. Co., Cleveland, O.
 Dominion Asbestos & Rubber Corp'n, 154 Nassau St., New York
 "Double Service" Packing Co., 246 Chestnut St., Philadelphia, Pa.
 Durabla Mfg. Co., 114 Liberty St., New York
 Eureka Packing Co., 77 Murray St., New York
 FRANCE PACKING CO., Tacony, Philadelphia, Pa... *p. 179*
 Garlock Packing Co., Palmyra, N. Y.
 GOODRICH RUBBER CO., B. F., Akron, O... *pp. 183, 242*
 Gould Packing Co., East Cambridge, Mass.
 Harper Mfg. Co., Chester, Pa.
 Hart Packing Co., 144 High St., Boston, Mass.
 High-Speed Metallic Packing Co., 305 N. Michigan Ave., Chicago, Ill.
 Holmes Metallic Packing Co., Wilkes-Barre, Pa.
 IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J... *p. 145*
 Ideal Metallic Packing Co., South Stillwater, Minn.
 Jerome-Edwards Metallic Packing Co., 320 N. May St., Chicago, Ill.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*
 Johnson Co., Henry, Gates Ave. & Blvd., Jersey City, N. J.
 NEW YORK RUBBER CO., 34 Reade St., New York... *pp. 244, 245*
 Pacific Coast Rubber & Supply Co., 316 Mission St., San Francisco, Cal.
 Paine Metallic Packing Co., Shawanese, Pa.
 Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.
 Steel Mill Packing Co., 42 W. Larned St., Detroit, Mich.
 UNITED LEAD CO., 111 Broadway, New York... *p. 299*
 UNITED STATES METALLIC PACKING CO., 221 N. 13th St., Philadelphia, Pa... *p. 181*
 WALKER & CO., LTD., JAMES, 27 Thames St., New York... *p. 182*
 Walsh Packing Co., 304 New St., Philadelphia, Pa.
 Wilcox Mfg. Co., E. A., Chicago, Ill.
—Rubber
 Anchor Packing Co., 7th & Filbert Sts., Philadelphia, Pa.
 Belmont Packing & Rubber Co., 133 N. Second St., Philadelphia, Pa.
 Cancoes Mfg. Co., Bridge & Garden Sts., Bridesburg, Philadelphia, Pa.
 Consolidated Rubber Co., Trenton, N. J.
 Danubil Co., 253 Broadway, New York
 Diamond Rubber Co., Inc., 555 Ellicott Sq., Buffalo, N. Y.
 Empire Rubber & Tire Co., Trenton, N. J.
 Eureka Packing Co., 77 Murray St., New York
 GOODRICH RUBBER CO., B. F., Akron, O... *pp. 183, 242*
 *JENKINS BROS., 80 White St., New York... *pp. 128, 129*
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*
 Johnson Co., Henry, Gates Ave. & Blvd., Jersey City, N. J.
 Mercer Rubber Co., Hamilton Square, N. J.
 New Jersey Asbestos Co., Camden, N. J.
 NEW YORK RUBBER CO., 34 Reade St., New York... *pp. 244, 245*
 Pacific Coast Rubber & Supply Co., 316 Mission St., San Francisco, Cal.
 Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.

Pac

See Catalogue Section for data of firms listed in capital type

PACKING (Continued)**—Rubber**

United States Rubber Co., 1790 Broadway, New York
WALKER & CO., LTD., JAMES, 27 Thames St., New York... *p. 182*

—Sheet

AMERICAN VULCANIZED FIBRE CO., Wilmington, Del... *p. 296*

Burgman Asbestos & Packing Mills, Feodore, 26 Cortlandt St., New York
Cancos Mfg. Co., Bridge & Garden Sts., Bridesburg, Philadelphia, Pa.

Danubil Co., 253 Broadway, New York
Dominion Asbestos & Rubber Corp'n, 154 Nassau St., New York

Endura Mfg. Co., 63rd & Eastwick Ave., Philadelphia, Pa.

Federal Asbestos Co., Paterson, N. J.

Garlock Packing Co., Palmyra, N. Y.

***GORTZ GASKET & PACKING CO., 22 Allen Ave., New Brunswick, N. J... p. 180**

GOODRICH RUBBER CO., B. F., Akron, O... pp. 183, 242

Hamilton Rubber Mfg. Co., Trenton, N. J.

Hart Packing Co., 144 High St., Boston, Mass.

***JENKINS BROS., 80 White St., New York... pp. 128, 129**

***JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... p. 162**

La Favorite Rubber Mfg. Co., Paterson, N. J.

NEW YORK RUBBER CO., 34 Reade St., New York... pp. 244, 245

Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.

Standard Mfg. & Supply Co. (Stanbesto), 30 N. 4th St., Philadelphia, Pa.

United States Asbestos Co., Fehl Bldg., Lancaster, Pa.

Voorhees Rubber Mfg. Co., 18-50 Bostwick Ave., Jersey City, N. J.

WALKER & CO., LTD., JAMES, 27 Thames St., New York... p. 182

—Throttle (Locomotive)

***JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... p. 162**

Union Machine Co., 183 University Ave., St. Paul, Minn.

PAINT MACHINERY

BARTLETT & SNOW CO., C. O., Cleveland, O... p. 249

Day Co., J. H., 1144 Harrison Ave., Cincinnati, O.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... p. 494

Ross & Son Co., Chas., 148-156 Classon Ave., Brooklyn, N. Y.

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... pp. 466, 467

PAINTS

—Acid Resistant

Barrett Co., 17 Battery Place, New York

—Asbestos

Acme Asbestos Covering & Supply Co., 407 N. Ada St., Chicago, Ill.

***JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... p. 162**

***WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115**

—Concrete

Smooth-On Mfg. Co., 570-574 Communipaw Ave., Jersey City, N. J.

—Graphite

United States Graphite Co., Saginaw, Mich.

—Steel Preservative

Toch Brothers, 320 Fifth Ave., New York

PANEL BOARDS

BENJAMIN ELECTRIC MFG. CO., 122 S. Sangamon St., Chicago, Ill... p. 504

PANS

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... pp. 44, 45

Katzinger Co., Edward, 120 N. Peoria St., Chicago, Ill.

—Assembling Work

Honhorst Co., Jos., 1016-20 W. 6th St., Cincinnati, O.

Katzinger Co., Edward, 120 N. Peoria St., Chicago, Ill.

NEW BRITAIN MACHINE CO., New Britain, Conn... p. 336

—Drip

Katzinger Co., Edward, 120 N. Peoria St., Chicago, Ill.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... p. 494

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... p. 476

—Grinding

BONNOT CO., Canton, O... p. 464

CHAMBERS BROS. CO., Philadelphia, Pa... p. 480

FROST MFG. CO., 112 W. Adams St., Chicago, Ill... pp. 47, 462

Pennsylvania Crusher Co., Stephen Girard Bldg., Philadelphia, Pa.

Phillips & McLaren, 24th & Smallman Sts., Pittsburgh, Pa.

Stevenson Co., Wellsville, O.

—Storage (For Machine Parts)

Katzinger Co., Edward, 120 Peoria St., Chicago, Ill.

—Vacuum

BADGER & SONS CO., E. B., Boston, Mass... p. 159

Kilby Mfg. Co., Cleveland, O.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... p. 494

Louisville Drying Machinery Co., 451 Barter Ave., Louisville, Ky.

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... p. 496

PFAUDLER CO., Rochester, N. Y... p. 499

Philadelphia Copper-smithing Co., 222-226 N. Front St., Philadelphia, Pa.

WILLCOX ENGINEERING CO., Saginaw, Mich... p. 516

—Vacuum (Steam Jacketed)

PFAUDLER CO., Rochester, N. Y... p. 499

MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis... p. 112

Sowers Mfg. Co., 1300 Niagara St., Buffalo, N. Y.

PAPER, ABRASIVE

CARBORUNDUM CO., Niagara Falls, N. Y... p. 389

PAPER BAG MACHINERY

Dienelt & Eisenhardt Inc., 1304 N. Howard St., Philadelphia, Pa.

Jagenberg Machine Co., Inc., 131 W. 24th St., New York

PAPER FOLDING MACHINES

CHAMBERS BROS. CO., Philadelphia, Pa... p. 480

Dexter Folder Co., 200 5th Ave., New York

PAPER MILL MACHINERY

Bagley & Sewall Co., Watertown, N. Y.

Bird Machine Co., East Walpole, Mass.

Black-Clawson Co., Hamilton, O.

Davis, Frank H., 175 Richdale Ave., Cambridge, Mass.

Dilts Machine Works, Inc., Fulton, N. Y.

Downington Mfg. Co., West Downingtown, Pa.

FARNHAM MFG. CO., 31-39 Indiana St., Buffalo, N. Y... p. 277

Holyoke Machine Co., Holyoke, Mass.

Jagenberg Machine Co., Inc., 131 W. 24th St., New York

Jones & Sons Co., E. D., P. O. Box 1632, Pittsfield, Mass.

Moore & White Co., Philadelphia, Pa.

Norwood Engineering Co., Florence, Mass.

Pusey & Jones Co., Wilmington, Del.

Rice, Barton & Fales Machine & Iron Co., Worcester, Mass.

Pac

Ryther & Pringle Co., Carthage, N. Y.
SANDUSKY FOUNDRY & MACHINE CO.
 Sandusky, O. . . *p. 488*
 Valley Iron Works Co., Appleton, Wis.

PAPER PULP MACHINERY

Davis, Frank H., 175 Richdale Ave., Cambridge, Mass.

Downington Mfg. Co., West Downington, Pa.
 International Process Co., 5 Beekman St., New York

Pusey & Jones Co., Wilmington, Del.
 Rice, Barton & Fales Machine & Iron Co., Worcester, Mass.

Ryther & Pringle Co., Carthage, N. Y.
 SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill. . . *p. 501*
 Union Iron Works, Bangor, Me.

Valley Iron Works Co., Appleton, Wis.

PAPER TESTING APPARATUS

Perkins & Son, B. F., Holyoke, Mass.

PAPER WORKING MACHINERY

Knowlton Co., M. D., 29 Elizabeth St., Rochester, N. Y.

PARAFFINE WAX PLANTS

VOGT MACHINE CO., HENRY, Louisville, Ky. . . *p. 63*

PARTITIONS

—Rolling

EDWARDS MFG. CO., 306-336 Eggleston Ave., Cincinnati, O. . . *p. 506*
 Wilson Corp'n, J. G., Norfolk, Va.

—Steel

Penn Metal Co., 201 Devonshire St., Boston, Mass.

PASTEURIZERS

Dairy Machinery & Construction Co., Derby, Conn.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . *p. 494*

*VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis. . . *p. 18*

PATTERN DRAWING MACHINES

Herman Pneumatic Machine Co., Pittsburgh, Pa.

PATTERN SHOP MACHINERY

Oliver Machinery Co., Grand Rapids, Mich.

PATTERNS (Metal and Wood)

BUDD GRATE CO., 2013 E. Letterly St., Kensington, Philadelphia, Pa. . . *p. 86*
 Fillmore Ave. Foundry & Iron Works, Inc., 153 Fillmore Ave., Buffalo, N. Y.

Klotz Machine Co., 318 W. Water St., Sandusky, O.

MEHL MACHINE TOOL & DIE CO., Roselle, N. J. . . *pp. 376, 377*

Munson, E. G., Carton Ave., Utica, N. Y.
 Schmidt Co., F. L., 150 11th Ave., New York
 Thacher & Co., George H., Albany, N. Y.

TORRINGTON MFG. CO., Torrington, Conn. . . *p. 483*

U. S. Molding Machine Co., 968 E. 69th Place, Cleveland, Ohio

Wallace, J. D., 1401 W. Jackson Blvd., Chicago, Ill.

WASHBURN & GRANGER, 50 Church St., New York. . . *p. 91*

Wunsch & Washburn, 207 Centre St., New York

—Gear, Machine Cut

Buffalo Gear & Pattern Works, 18 Elk St., Buffalo, N. Y.

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill. . . *p. 194*

PAVING BLOCK MACHINES

Cummer & Son Co., F. D. (Cummer), 413 The Arcade, Cleveland, O.

PAVING BLOCKS

—Asphalt

HASTINGS PAVEMENT CO., 25 Broad St., New York. . . *p. 507*

—Wood

Wyckoff Pipe & Creosoting Co., 30 E. 42nd St., New York

PAVING PLANTS, ASPHALT

Barber Asphalt Paving Co., Land Title Bldg., Philadelphia, Pa.

Warren Bros. Co., 142 Berkeley St., Boston, Mass.

PEBBLE MILLS

(See Mills, Pebble)

PENSTOCKS

Kellogg Co., M. W., 90 West St., New York

Smith Co., S. M. rgan, York, Pa.

PERFORATED SHEET METALS

(See Metals, Perforated)

PETROLEUM PRODUCTS

Atlantic Refining Co., 3144 Passyunk Ave., Philadelphia, Pa.

Penn Oil & Supply Co., Oil City, Pa.

Petroleum Refining Co., 1502 Carter Bldg., Houston, Texas

SWAN & FINCH CO., 165 Broadway, New York . . . *p. 174*

*THE TEXAS COMPANY, 17 Battery Place, New York. . . *p. 175*

TIDE WATER OIL CO., 11 Broadway, New York. . . *p. 176*

Waverly Oil Works Co., 54th St., Pittsburgh, Pa.

PHARMACEUTICAL MACHINERY

Colton Co., Arthur, Jefferson Ave., Detroit, Mich.
 Hess & Barker, 236 S. 8th St., Philadelphia, Pa.

PHOSPHOR COPPER

Syracuse Smelting Works, 192 Diamond St., Chicago, Ill.

PHOSPHOR TIN

Empire Metal Co., Syracuse, N. Y.

Syracuse Smelting Works, 192 Diamond St., Brooklyn, N. Y.

PHOTO-ENGRAVERS' MACHINERY

Royle & Sons, John, Paterson, N. J.

PIANO ACTION MACHINES

Baird Machine Co., Bridgeport, Conn.

Nilson Machine Co., A. H., 1525 Railroad Ave., Bridgeport, Conn.

PILE DRIVERS

*CLYDE IRON WORKS, 29th Ave. W., & Michigan St., Duluth, Minn. . . *p. 268*

INDUSTRIAL WORKS, Bay City, Mich. . . *pp. 266, 267*

*LIDGERWOOD MFG. CO., 96 Liberty St., New York. . . *p. 271*

McKiernan-Terry Drill Co., 15 Park Row, New York

Union Iron Works, Newark Ave. & Monroe St., Hoboken, N. J.

PILING MACHINES, CASE

BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill. . . *p. 262*

PILING, SHEET (Steel)

Lackawanna Steel Co., Buffalo, N. Y.

PILLOW BLOCKS

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind. . . *p. 35*

DODGE SALES & ENGINEERING CO., Mishawaka, Ind. . . *pp. 202, 203, 204, 205, 206*

*FALLS CLUTCH & MACHINERY CO., Cuyahoga Falls, O. . . *p. 207*

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill. . . *pp. 258, 259, 260*

*WOODS' SONS CO., T. B., Chambersburg, Pa. . . *pp. 212, 213*

PIN MACHINES

Baird Machine Co., Bridgeport, Conn.

PINION CUTTING MACHINES (Clock and Watch)

SLOAN & CHACE MFG. CO., LTD., Sixth Ave., Cor. N. 13th St., Newark, N. J. . . *p. 357*

Waltham Machine Works, Waltham, Mass.

PINIONS**—B kelite**

Ganschow Co., Wm., Washington-Morgan St., Chicago, Ill.

—Rawhide

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky... *p. 201*

Ganschow Co., Wm., Washington-Morgan St., Chicago, Ill.

Gerdes Co., Inc., 30 Church St., New York
Hamilton Gear & Machine Co., Van Horne St., Toronto, Canada

Horsburgh & Scott Co., Cleveland, O.

*JAMES MFG. CO., D. O., 1118-24 W. Monroe St., Chicago, Ill... *pp. 192, 193*

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... *p. 194*

Philadelphia Gear Works, 1120-24 Vine St., Philadelphia, Pa.

Stahl Gear & Machine Co., 1390 E. 40th St., Cleveland, O.

VAN DORN & DUTTON CO., Cleveland, O... *p. 370*

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

—Steel

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky... *p. 201*

DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*

*JAMES MFG. CO., D. O., 1118-24 W. Monroe St., Chicago, Ill... *pp. 192, 193*

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... *p. 194*

*POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md... *pp. 196, 197*

VAN DORN & DUTTON CO., Cleveland, O... *p. 370*

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

PINKING MACHINES

Oswego Machine Works, Oswego, N. Y.

PINS**—Air Brake**

CHAMPION RIVET CO., Cleveland, O... *p. 408*

—Clevis

CINCINNATI SCREW CO., Twilight, O. (Cincinnati Suburb)... *p. 402*

—Knuckle

CHAMPION RIVET CO., Cleveland, O... *p. 408*

—Piston

Michigan Screw Co., Lansing, Mich.

—Taper

Belvidere Screw & Machine Co., Belvidere, Ill.
CINCINNATI SCREW CO., Twilight, O. (Cincinnati Suburb)... *p. 402*

—Cast Iron (Flanged)

American Car & Foundry Co., 165 Broadway, New York

American Cast Iron Pipe Co., Birmingham, Ala.

*CENTRAL FOUNDRY CO., 90 West St., New York... *p. 155*

Clow & Sons, James B., Chicago, Ill.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

Davis & Farnum Mfg. Co., Foundry Ave., Waltham, Mass.

Donaldson Iron Co., Emaus, Lehigh Co., Pa.

Glamorgan Pipe & Foundry Co., Lynchburg, Va.

LYNCHBURG FOUNDRY CO., 816 Peoples Gas Bldg., Chicago, Ill... *p. 156*

Massillon Iron & Steel Co., Massillon, O.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 135*

Sacramento Pipe Works, 716 R St., Sacramento, Cal.

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Standard Cast Iron Pipe & Foundry Co., Bristol, Pa.

United States Cast Iron Pipe & Fdry. Co., Burlington, N. J.

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

—Cast Iron (Flexible Joint)

*CENTRAL FOUNDRY CO., 90 West St., New York... *p. 155*

Donaldson Iron Co., Emaus, Lehigh Co., Pa.

—Hard Rubber Lined

American Hard Rubber Co., 11 Mercer St., New York

—Iron, Lead Lined

UNITED LEAD CO., 111 Broadway, New York... *p. 299*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

—Lap Weld

MONONGAHELA TUBE CO., Pittsburgh, Pa... *p. 70*

—Lead

UNITED LEAD CO., 111 Broadway, New York... *p. 299*

—Riveted

Abendroth & Root Mfg. Co., 45 Broadway, New York

American Spiral Pipe Works, Box 485, Chicago, Ill.

Baker Iron Works, 960 N. Broadway, Los Angeles, Cal.

BLAW-KNOX CO. (Knox), Pittsburgh, Pa... *p. 489*

Carroll-Porter Boiler & Tank Co., Pittsburgh, Pa.

*CASEY-HEDGES CO., Chattanooga, Tenn... *pp. 42, 43*

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 494*

Lancaster Iron Works, Inc., Lancaster, Pa.

*LEFFEL & CO., JAMES, Springfield, O... *p. 453*

McAleenan Bros. Co., 25th & R. R. Sts., Pittsburgh, Pa.

McNeil & Bro. Co., James, 29th St. & A. V. R. R., Pittsburgh, Pa.

Machold & Riddell, 1020 Stephen Girard Bldg., Philadelphia, Pa.

Penn Metal Co., 201 Devonshire St., Boston, Mass.

Sacramento Pipe Works, 716 R St., Sacramento, Cal.

Sharpsville Boiler Works Co., Sharpsville, Pa.

*SPRINGFIELD BOILER CO., Springfield, Ill... *p. 60*

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p. 64*

Warren City Tank & Boiler Co., Warren, O.

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

—Soll

*CENTRAL FOUNDRY CO., 90 West St., New York... *p. 155*

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Pin

—Steel

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123

La Belle Iron Works, Steubenville, O.

MARK MFG. CO., P. O. Box G, Chicago, Ill. . . p. 160

National Tube Co. (National), Frick Bldg., Pittsburgh, Pa.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa. . . pp. 132, 133

SIMMONS CO., JOHN, 110 Center St., New York. . . p. 515

Standard Spiral Pipe Works, 4801 S. Rockwell St., Chicago, Ill.

Youngstown Sheet & Tube Co., Youngstown, O.

—Tin-lined

UNITED LEAD CO., 111 Broadway, New York. . . p. 299

—Welded

American Spiral Pipe Works, Box 485, Chicago, Ill.

Ballwood Co., 30 Church St., New York

Best Co., 3221 Spruce Way, Pittsburgh, Pa.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123

MARK MFG. CO., P. O. Box G, Chicago, Ill. . . p. 160

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa. . . pp. 132, 133

SIMMONS CO., JOHN, 110 Center St., New York. . . p. 515

STERRE ENGINEERING CO., Woodward & Horton Ave., Detroit, Mich. . . p. 503

—Wood

WYCKOFF & SON CO., A., Elmira, N. Y. . . p. 163

—Wrought Iron

BYERS CO., A. M., Pittsburgh, Pa. . . p. 154

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123

McMann & Taylor Co., 104-106 John St., New York

MONONGAHELA TUBE CO., Pittsburgh, Pa. . . p. 70

Pancoast & Co., Henry B., 940-962 N. Front St., Philadelphia, Pa.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa. . . pp. 132, 133

Reading Iron Co., Reading, Pa.

Sacramento Pipe Works, 716 R St., Sacramento, Cal.

SIMMONS CO., JOHN, 110 Center St., New York. . . p. 515

PIPE BENDING

(See Bends, Pipe)

PIPE BENDING MACHINES

American Pipe Bending Machine Co., 46 Pearl St., Boston, Mass.

Cox Engrg. & Tube Bending Machine Works, J. Fillmore, 681-687 Boulevard, Bayonne, N. J.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123

Pedrick Tool & Machine Co., 3842 N. Lawrence St., Philadelphia, Pa.

Lewis, Joseph E., 1218 Warner St., Baltimore, Md.

Riverside Machine Co., Front & Penn Sts., Chester, Pa.

WATSON-STILLMAN CO., 35 Church St., New York. . . p. 457

WOOD & CO., R. D., Philadelphia, Pa. . . p. 458

PIPE CLAMPS, COILS, COVERINGS, CUTTERS, FITTINGS, JOINTS, ETC.

(See Clamps, Coils, Coverings, Cutters, Fittings, Joints, etc., Pipe)

PIPE CUTTING AND THREADING MACHINES

Bignall & Keeler Machine Works, Edwardsville, Ill.

Borden Co. (Beaver), Warren, O.

Cox & Sons Co., 819 Lafayette Place, Philadelphia, Pa.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123

Curtis & Curtis Co., 188 Garden St., Bridgeport, Conn.

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass. . . pp. 374, 375

Jarecki Mfg. Co., Erie, Pa.

LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373

Loew Mfg. Co., 9001 Madison Ave., N. W., Cleveland, O.

Merrell Mfg. Co., 845 Curtis St., Toledo, O.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344

Oster Mfg. Co., 2057 E. 61st Place, Cleveland, O.

Pipe Machinery Co., 930 E. 70th St., Cleveland, O.

Saunders' Sons, Inc., D., 21 Atherton St., Yonkers, N. Y.

Standard Engineering Co., Ellwood City, Pa.

Williams Tool Co., Erie, Pa.

PIPE CUTTING-OFF MACHINES

Bignall & Keeler Machine Works, Edwardsville, Ill.

Merrell Mfg. Co., 845 Curtis St., Toledo, O.

Modern Machine Tool Co., Jackson, Mich.

Murchev Machine & Tool Co., 85 Porter St., Detroit, Mich.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . p. 344

LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373

San Francisco Engineering Co., 322-324 6th St., San Francisco, Cal.

Smith Mfg. Co., A. P., East Orange, N. J.

PIPE EXPANDING AND FLANGING MACHINES

Lovekin Pipe Expanding & Flanging Machine Co., 421 Chestnut St., Philadelphia, Pa.

PIPE LINE SUPPLIES

National Supply Co., 136 Huron St., Toledo, O.

PIPE MILL MACHINERY

LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373

Standard Engineering Co., Ellwood City, Pa.

PIPE THREADING DEVICES

(See Tools, Thread Cutting)

PIPING

—Heating

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill. . . p. 56

—Power

Ballwood Co., 30 Church St., New York

Cox Engrg. & Tube Bending Machine Works, J. Fillmore, 681-687 Boulevard, Bayonne, N. J.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123

Kellogg Co., M. W., 90 West St., New York

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill. . . p. 56

Limbirt & Co., Geo. B., 570 Fulton St., Chicago, Ill.

Lumsden & Van Stone Co., 426 First St., South Boston, Mass.

Mitchell & Co., Inc., W. K., 2940 Ellsworth St., Philadelphia, Pa.

National Valve & Mfg. Co., Pittsburgh, Pa.

Pancoast & Co. Henry B., 940-942 N. Front St., Philadelphia, Pa.

PARKS CO., G. M., Fitchburg, Mass. . . p. 472

Pittsburgh Piping & Equipment Co., 35th & Charlotte Sts., Pittsburgh, Pa.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa. . . pp. 132, 133

Shaw-Kendall Engineering Co., 120 S. Superior St., Toledo, O.

SIMMONS CO., JOHN, 110 Center St., New York. . . p. 515

Whitney Felker Co., E. Tioga & Memphis Sts., Philadelphia, Pa.

Pip

See Catalogue Section for data of firms listed in capital type

PIPING (Continued)

—**Power**
WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

PISTON RINGS

American Metallic Packing Co., 3621-23-25 Mexico Ave., North Side, Pittsburgh, Pa.
Baker Valve Co., Box 1772, Minneapolis, Minn.
Dyer Co., G. H., 155 Brookline St., Cambridge, Mass.
Ever-Tight Piston Ring Co., 1600 Kingsland Ave., St. Louis, Mo.
Iron City Products Co., Pittsburgh, Pa.
Keys Piston Ring Co., 3047-49-51 Olive St., St. Louis, Mo.
Micro Piston Ring Co. (Micro), 110-116 Nassau St., New York
Provost Engineering Corp'n, 220 Broadway, Brooklyn, N. Y.
Teetor-Hartley Motor Corp'n, Hagerstown, Ind.

PISTON TURNING MACHINES (Automobile)

INTERNATIONAL MACHINE TOOL CO., 1124 W. 21st St., Indianapolis, Ind... *pp. 322, 323*

NATIONAL ACME CO., Cleveland, O... *pp. 334, 335*

PISTONS

Baker Valve Co., Box 1772, Minneapolis, Minn.
—**Aluminum**
Aluminum Castings Co., 6205 Carnegie Ave., Cleveland, O.
—**Gasoline Engine**

Dyer Co., G. H., 155 Brookline St., Cambridge, Mass.

PITOT TUBES

(See Meters, Pitot Tube)

PLANER ATTACHMENTS

CINCINNATI PLANER CO., Oakley, Cincinnati, O... *pp. 338, 339*

Pip

PLANERS

American Tool Works Co., Pearl & Eggleston Aves., Cincinnati, O.
Betts Machine Co., Rochester, N. Y.
CINCINNATI PLANER CO., Oakley, Cincinnati, O... *pp. 338, 339*
Cleveland Planer Works, 3148 Superior Ave., Cleveland, O.
Hamilton Machine Tool Co., Hamilton, O.
LYND-FARQUHAR CO., Boston, Mass... *p. 348*

Ohio Machine Tool Co., Kenton, O.
Powell Machine Co., 243 Stafford St., Worcester, Mass.

Simmons Machine Co., Albany, N. Y.
Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

Wilson Machine Co., W. A., 217 N. Water St., Rochester, N. Y.
Woodward & Powell Planer Co., Worcester, Mass.

—**Locomotive Cylinder**

CINCINNATI PLANER CO., Oakley, Cincinnati, O... *pp. 338, 339*
Morton Mfg. Co., Muskegon Heights, Mich

—**Plate**

Covington Machine Co., Covington, Va.
Hilles & Jones Co., Wilmington, Del.
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p. 456*

—**Traveling Head**

Morton Mfg. Co., Muskegon Heights, Mich.

—**Variable Speed**

CINCINNATI PLANER CO., Oakley, Cincinnati, O... *pp. 338, 339*
Gray Co., G. A., Gest & Depot Sts., Cincinnati, O.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Ohio Machine Tool Co., Kenton, O.
Woodward & Powell Planer Co., Worcester, Mass.

PLANIMETERS

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*

BRISTOL CO., Waterbury, Conn... *p. 530*
CROSBY STEAM GAUGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*

*FOXBORO CO., INC., Foxboro, Mass... *p. 533*

Robertson & Sons, Jas. L. (Willis), 78-80 Murray St., New York
Trill Indicator Co., Center St., Cory, Pa.

PLASTER MILL MACHINERY

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp. 466, 467*

PLATE METAL WORK

(See Steel Plate Construction)

PLATERS' SUPPLIES AND EQUIPMENT
WOODISON CO., E. J., Detroit, Mich... *p. 463*

PLATES

—**Arch (Boiler)**
Lamprey Co., 285 Elm St., Westfield, Mass.

—**Boller**

LUKENS STEEL CO., Coatesville, Pa... *p. 69*
Scully Steel & Iron Co., P. O. Box 814, Chicago, Ill.

—**Flattened, Ground and Polished**

Moltrup Steel Products Co., Beaver Falls, Pa.

—**Foundry Pattern**

Moltrup Steel Products Co., Beaver Falls, Pa.

—**Screw**

(See Screw Plates)

—**Steel**

Allegheny Steel Co., Pittsburgh, Pa.
Carbon Steel Co., P. O. Box 1591, Pittsburgh, Pa.
Central Iron & Steel Co., Harrisburg, Pa.
GLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa... *p. 68*

Illinois Steel Co., 208 S. LaSalle St., Chicago, Ill.
LUKENS STEEL CO., Coatesville, Pa... *p. 69*
Otis Steel Co., 3131 Lakeside Ave., Cleveland, O.

Penn Seaboard Steel Corp'n, Franklin Bank Bldg., Philadelphia, Pa.
Simonds Mfg. Co., Fitchburg, Mass

Sligo Iron & Steel Co., Connellsville, Pa.
Wood Iron & Steel Co., Alan, Widener Bldg., Philadelphia, Pa

—**Structural Steel**

LUKENS STEEL CO., Coatesville, Pa... *p. 69*

—**Universal**

Central Iron & Steel Co., Harrisburg, Pa.
GLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa... *p. 68*

La Belle Iron Works, Steubenville, O.
LUKENS STEEL CO., Coatesville, Pa... *p. 69*

—**Zinc**

Illinois Zinc Co., Peru, Ill.

PLATING DYNAMOS

(See Generators, Low Voltage)

PLUGS

—**Fusible**

AMERICAN INJECTOR CO., Detroit, Mich... *p. 151*

Boston Steam Specialty Co., 185 Franklin St., Boston, Mass.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

D & W FUSE CO., Providence, R. I... *p. 393*
DETROIT LUBRICATOR CO., Detroit, Mich... *p. 167*

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*
Rich Mfg. Co., 370 Atlantic Ave., Boston, Mass.

—**Spark**

Belvidere Screw & Machine Co., Belvidere, Ill.
Champion Ignition Co., Industrial Ave. & Harriet St., Flint, Mich.

Advertisements of firms marked * appear in The Journal, A. S. M. E.

MECHANICAL EQUIPMENT DIRECTORY

Craig Mfg. Co., Cedar Rapids, Iowa
Hartford Machine Screw Co., Hartford, Conn.
New Haven Screw Co., 191-193 Foster St., New Haven, Conn.
Symonds Co., Joseph H. (Symonds), Melrose, Mass.
WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . . *pp. 114, 115*
PLUNGERS, CHILLED IRON
SPRING-CARPENTER PUMP CO., Pittsburgh, Pa. . . . *p. 441*
PNEUMATIC DESPATCH TUBES
See Tubes, Pneumatic Despatch)
POINTERS, BOLT
ANDIS MACHINE CO., INC., Waynes, Pa. . . . *pp. 372, 373*
POLISHERS' SUPPLIES AND EQUIPMENT
WOODISON CO., E. J., Detroit, Mich. . . . *p. 463*
POLISHING MACHINERY
Rickford & Francis Belting Co., Buffalo, N. Y.
Hewney Machine Co., Greenfield, Mass.
BUILDERS IRON FOUNDRY, Providence, R. I. . . . *p. 520*
Hase Turbine Mfg. Co., Orange, Mass.
Chicago Wheel & Mfg. Co., 1101-1103 W. Monroe St., Chicago, Ill.
Hvine Bros. Co., Utica, N. Y.
Hxelsior Tool & Machine Co., East St. Louis, Mo.
Hrbes & Myers, 173 Union St., Worcester, Mass.
Hrder Machine Co., Beloit, Wis.
Hammond Mfg. Co., 336 Frankfort Ave., Cleveland, O.
HEW BRITAIN MACHINE CO., New Britain, Conn. . . . *p. 336*
HOBLE & WESTBROOK MFG. CO., Hartford, Conn. . . . *p. 368*
Hrtridge, E. O., 2047-2049 W. Lake St., Chicago, Ill.
Hrbinson Automatic Machine Co., 1525 Rippelle St., Detroit, Mich.
Hrbinson Co., Wm. V., Owosso, Mich.
Hr Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo.
HEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O. . . . *p. 365*
Cutlery
Hrmming Bros. Co., Inc., New Haven, Conn.
OTS
Acid
Hrarr & Trefts, Inc., Perry & Illinois Sts., Buffalo, N. Y.
HrNCHBURG FOUNDRY CO., 816 People's Gas Bldg., Chicago, Ill. . . . *p. 156*
Annealing
LAW-KNOX CO. (Knox), Pittsburgh, Pa. . . . *p. 489*
Hrinder, Chemical Slag, Etc.
HrSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. . . . *p. 496*
Galvanizing
LAW-KNOX CO. (Knox), Pittsburgh, Pa. . . . *p. 489*
HrASEY-HEDGES CO., Chattanooga, Tenn. . . . *pp. 42, 43*
HrSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. . . . *p. 496*
Hardening and Tempering
Hrwood Bronze & Iron Works, Garwood, N. J.
Tinning
HrGENERAL ELECTRIC CO., Schenectady, N. Y. . . . *pp. 20, 21, 521*
HrSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. . . . *p. 496*
BATTERY MACHINERY
Hrossley Machine Co., State & Monmouth Sts., Trenton, N. J.
Hrterson Foundry & Machine Co., East Liverpool, O.
WDERED FUEL EQUIPMENT
ro Pulverizer Co., 120 Broadway, New York

BARTLETT & SNOW CO., C. O., Cleveland, . . . *p. 249*
BONNOT CO., Canton, O. . . . *p. 464*
*FULLER-LEHIGH CO., Fullerton, Pa. . . . *p. 92*
*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York. . . . *p. 93*
Metals Production Equipment Co., 105 W. 40th St., New York
Powdered Coal Engrg. & Equipment Co., 215 Washington Blvd., Chicago, Ill.
*QUIGLEY FURNACE SPECIALTIES CO., 26 Cortlandt St., New York. . . . *pp. 94, 100*
Raymond Bros. Impact Pulverizer Co., 1315 N. Branch St., Chicago, Ill.
Ruggles-Coles Engineering Co., 50 Church St., New York
STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . . *pp. 466, 467*
*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York. . . . *pp. 30, 117, 431, 447*
POWER TRANSMISSION MACHINERY
*ALLIS CHALMERS MFG. CO., Milwaukee, Wis. . . . *p. 15*
American Machinery & Construction Co., 103 W. Water St., Milwaukee, Wis.
AMERICAN TOOL & MACHINE CO., Boston, Mass. . . . *p. 490*
Birmingham Iron Foundry, Derby, Conn.
Bond Foundry & Machine Co., Manheim, Pa.
*BROWN CO., A. & F., 79 Barclay St., New York. . . . *p. 187*
*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . . *p. 250*
CALDWELL CO., INC., W. E., 340 E. Brandels St., Louisville, Ky. . . . *p. 201*
*CHAIN BELT CO., 735 Park St., Milwaukee, Wis. . . . *pp. 118, 119*
Conway & Co., Brighton, Cincinnati, O.
Cresson-Morris Co., 18th St. & Allegheny Ave., Philadelphia, Pa.
Cross Gear & Engine Co., 800-806 Bellevue Ave., Detroit, Mich.
Davis Foundry & Machine Works, Rome, Ga.
DODGE SALES & ENGINEERING CO., Mishawaka, Ind. . . . *pp. 202, 203, 204, 205, 206*
Eastwood Co., Benjamin, Paterson, N. J.
Fairmount Foundry & Engineering Works, Woonsocket, R. I.
*FALLS CLUTCH & MACHINERY CO., Cuyahoga Falls, O. . . . *p. 207*
Franklin Machine Co., 189 Charles St., Providence, R. I.
Freese & Co., E. M., 180 South St., Galion, O.
Hanson Clutch & Machinery Co., Tiffin, O.
*HILL CLUTCH CO., Cleveland, O. . . . *p. 208*
Holyoke Machine Co., Holyoke, Mass.
*HUNT MACHINE CO., Rodney, Orange, Mass. . . . *p. 449*
Jeffrey Mfg. Co., 904 North Fourth St., Columbus, Ohio
Jones & Laughlin Steel Co., 3rd Ave. & Ry., Pittsburgh, Pa.
Jones & Sons Co., E. D., P. O. Box 1632, Pittsburgh, Pa.
*LEFFEL & CO., JAMES, Springfield, O. . . . *p. 453*
*LINK-BELT CO., 39th & Stewart Ave., Chicago, Ill. . . . *p. 256*
Lombard Iron Works & Supply Co., Augusta, Ga.
Medart Patent Pulley Co., St. Louis, Mo.
Meese & Gottfried Co., 660 Mission St., San Francisco, Cal.
Mey Chain Belt Co., Inc., 82 Washington St., Buffalo, N. Y.
*MORSE CHAIN CO., Ithaca, N. Y. . . . *p. 199*
National Foundry Mfg. & Supply Co., Williamsport, Pa.
Naylor Bros., Peekskill, N. Y.
Nordyke & Marmon Co., Indianapolis, Ind.
Plamondon Mfg. Co., A., 12 N. Clinton St., Chicago, Ill.
*POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md. . . . *pp. 196, 197*

Pow

See Catalogue Section for data of firms listed in capital type

POWER TRANSMISSION MACHINERY

(Continued)

Prybil Machine Co., P., 512 W. 41st St., New York

*ROYERSFORD FOUNDRY & MACHINE CO., 52 N. 5th St., Philadelphia, Pa...*pp.* 228, 229

Sellers & Co., Inc., Wm., Philadelphia, Pa.

Thomas Coupling Co., Troy, Pa.

Union Iron Works, Decatur, Ill.

WELLER MFG. CO., 1820-1850 N. Kostner Ave., Chicago, Ill...*pp.* 258, 259, 260*WOODS' SONS CO., T. B., Chambersburg, Pa...*pp.* 212, 213

Yocom & Son, Jas., 145 N. 2nd St., Philadelphia, Pa.

PRESERVATIVES

—Belt

RHOADS & SONS, J. E., 12 N. Third St., Philadelphia, Pa...*pp.* 238, 239

—Wire Rope

Cling-Surface Co., 1048 Niagara St., Buffalo, N. Y.

Ironssides Co., Columbus, O.

PRESSED STEEL PRODUCTS

(See Shapes, Pressed Steel)

PRESSES

—Arbor

ATLAS PRESS CO., 310 N. Park St., Kalamazoo, Mich...*p.* 318

Bartlett, Edwin E., 41 Crown St., Nashua, N. H.

Hannfin Mfg. Co., Chicago, Ill.

NILES-BEMENT-POND CO., 111 Broadway, New York...*p.* 344

United Engine & Mfg. Co., Hanover, Pa.

WATSON-STILLMAN CO., 35 Church St., New York...*p.* 457

—Baling

Birmingham Machine & Foundry Co., Birmingham, Ala.

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis...*p.* 455

Logemann Bros. Co., 3120 Burleigh St., Milwaukee, Wis.

PHILADELPHIA DRYING MACHINERY CO., Stokely St., Philadelphia, Pa...*p.* 473WATSON-STILLMAN CO., 35 Church St., New York...*p.* 457

—Banding

Metalwood Mfg. Co., Lieb & Wight Sts., Detroit, Mich.

—Blanking

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y...*pp.* 310, 311

Gilro Machine Co., Foot 9th Ave., Oakland, Cal.

Leffer & Co., Charles, 49-73 Clymer St., Brooklyn, N. Y.

Meriden Press & Drop Co., 153 State St., Meriden, Conn.

TOLEDO MACHINE & TOOL CO., Toledo, O...*p.* 313TORRINGTON MFG. CO., Torrington, Conn...*p.* 483

V & O Press Co., Glendale, L. I., N. Y.

WATSON-STILLMAN CO., 35 Church St., New York...*p.* 457

Zeh & Hahnemann Co., Ave. A & Vanderpool St., Newark, N. J.

—Broaching

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y...*pp.* 310, 311GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis...*p.* 455

V & O Press Co., Glendale, L. I., N. Y.

WATSON-STILLMAN CO., 35 Church St., New York...*p.* 457

—Draw

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y...*pp.* 310, 311GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis...*p.* 455

Gilro Machine Co., Ft. of 9th Ave., Oakland, Cal.

NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y...*p.* 312SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa...*p.* 456TORRINGTON MFG. CO., Torrington, Conn...*p.* 483WATSON-STILLMAN CO., 35 Church St., New York...*p.* 457

—Drop

Meriden Press & Drop Co., 153 State St., Meriden, Conn.

Miner & Peck Mfg. Co., New Haven, Conn.

TOLEDO MACHINE & TOOL CO., Toledo, O...*p.* 313WILLIAMS, WHITE & CO., Moline, Ill...*p.* 314

—Drying

GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis...*p.* 455

—Extruding

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y...*pp.* 310, 311BURROUGHS CO., CHARLES, Newark, N. J...*p.* 454

Robertson & Co., John, 133 Water St., Brooklyn, N. Y.

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa...*p.* 456WATSON-STILLMAN CO., 35 Church St., New York...*p.* 457WOOD & CO., R. D., Philadelphia, Pa...*p.* 458

—Filter

Abbé Engrg. Co., 220 Broadway, New York

Carbondale Machine Co., Carbondale, Pa.

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill...*p.* 194

Perrin & Co., Wm. R., 37 W. Van Buren St., Chicago, Ill.

PHOENIX IRON WORKS CO., Meadville, Pa...*p.* 497PLATT IRON WORKS, Dayton, O...*p.* 446

Provost Engineering Corp'n, 220 Broadway, Brooklyn, N. Y.

Shriver & Co., T. R., 844 Hamilton St., Harrison, N. J.

United Filters Corp'n, 26 Flatbush Ave. Extension, Brooklyn, N. Y.

UNITED LEAD CO., 111 Broadway, New York...*p.* 299VOGT MACHINE CO., HENRY, Louisville, Ky...*p.* 63

—Filter (Experimental)

Perrin & Co., Wm. R., 37 W. Van Buren St., Chicago, Ill.

—Foot and Hand

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y...*pp.* 310, 311

Kidder Mfg. Co., J. F., Burlington, Vt.

Partridge, E. O., 2047-49 W. Lake St., Chicago, Ill.

*ROYERSFORD FOUNDRY & MACHINE CO., 52 N. 5th St., Philadelphia, Pa...*pp.* 228, 229

Taylor & Fenn Co., Hartford, Conn.

V & O Press Co., Glendale, L. I., N. Y.

—Forging

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y...*pp.* 310, 311

Consolidated Press Co., Hastings, Mich.

Garison Foundry Co., A., Pittsburgh, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York...*p.* 344SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa...*p.* 456TOLEDO MACHINE & TOOL CO., Toledo, O...*p.* 313**Pow**

WATSON-STILLMAN CO., 35 Church St., New York... *p.* 457
 WILLIAMS, WHITE & CO., Moline, Ill... *p.* 314
 WOOD & CO., R. D., Philadelphia, Pa... *p.* 458
—Forging (Steam Hydraulic)
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p.* 456
—Hydraulic
 ALLIANCE MACHINE CO., Alliance, O... *p.* 264
 Birch Hintz Mfg. Co., 1100-1110 S. Kilbourn Ave., Chicago, Ill.
 Birdshoro Steel Foundry & Machine Co., Birdsboro, Pa.
 BUCKEYE IRON & BRASS WORKS, Dayton, O... *p.* 481
 BURROUGHS CO., CHARLES, Newark, N. J... *p.* 454
 Chambersburg Engineering Co., Chambersburg, Pa.
 Dunning & Boschert Press Co., Inc., 331 West Water St., Syracuse, N. Y.
 Elmes Engineering Works, Chas. F., 215 N. Morgan St., Chicago, Ill.
 *FALLS CLUTCH & MACHINERY CO., Cuyahoga Falls, O... *p.* 207
 GALLAND-HENNING MFG. CO., 26t -27th Ave. & Layton Park, Milwaukee, Wis... *p.* 455
 Gerdes Co., Inc., 30 Church St., New York
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio
 McCall Machine Works, Rochester, N. Y.
 Metalwood Mfg. Co., Leib & Wight Sts., Detroit, Mich.
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 OLSEN TESTING MACHINE CO., TINIUS, 500 N. 12th St., Philadelphia, Pa... *p.* 511
 Perrin & Co., Wm. R., 37 W. Van Buren St., Chicago, Ill.
 PHILADELPHIA DRYING MACHINERY CO., Stokely St., Philadelphia, Pa... *p.* 473
 RIEHLE BROS. TESTING MACHINE CO., 1424 N. 9th St., Philadelphia, Pa... *p.* 512
 Robertson & Co., John, 133 Water St., Brooklyn, N. Y.
 Shilver & Co., T., 841 Hamilton St., Harrison, N. J.
 SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p.* 456
 Utility Mfg. Co., Cudahy, Wis.
 WATSON STILLMAN CO., 35 Church St., New York... *p.* 457
 Weaver Mfg. Co., Springfield, Ill.
 WILLIAMS FOUNDRY & MACHINE CO., 54-56 Cherry St., Akron, O... *p.* 214
 WILLIAMS, WHITE & CO., Moline, Ill... *p.* 314
 WOOD & CO., R. D., Philadelphia, Pa... *p.* 458
—Hydro-Pneumatic
 Metalwood Mfg. Co., Leib & Wight Sts., Detroit, Mich.
—Hydrostatic Testing
 Metalwood Mfg. Co., Leib & Wight Sts., Detroit, Mich.
—Inclinable
 Ans Machine Co., Max, Bridgeport, Conn.
 BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp.* 310, 311
 Consolidated Press Co., Hastings, Mich.
 Leffler & Co., Charles, 49-73 Clymer St., Brooklyn, N. Y.
 Massillon Foundry & Machine Co., Massillon, O.
 NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y... *p.* 312
 NILES-BEMENT-POND CO., 111 Broadway, New York, *p.* 344
 V & O Press Co., Glendale, L. I., N. Y.
 Zeh & Hahnemann Co., Ave. A & Vanderpool St., Newark, N. J.

—Lead Encasing
 Robertson & Co., John, 133 Water St., Brooklyn, N. Y.
 UNITED LEAD CO., 111 Broadway, New York... *p.* 299
—Percussion
 Zeh & Hahnemann Co., Ave. A & Vanderpool St., Newark, N. J.
—Platen (Hydraulic)
 BURROUGHS CO., CHARLES, Newark, N. J... *p.* 454
 GALLAND-HENNING MFG. CO., 26th-27th Ave. & Layton Park, Milwaukee, Wis... *p.* 455
—Power
 American Compressor & Pump Co., 801-805 E. Pratt St., Baltimore, Md.
 Atlas Machine Co., 140 Manhan St., Waterbury, Conn.
 BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *p.* 310, 311
 Buckeye Engine Co., Salem, O.
 Cleveland Machine & Mfg. Co., 4938-4952 Hamilton Ave., Cleveland, O.
 Consolidated Press Co., Hastings, Mich.
 Kane & Roach, Niagara & Shonnard St., Syracuse, N. Y.
 Lehmann Machine Co., 606-612 S. Broadway, St. Louis, Mo.
 Loy & Nawrath Co., 21-29 Runyon St., Newark, N. J.
 Lucas Machine Tool Co., Cleveland, O.
 Manville Machine Co., E. J., Waterbury, Conn.
 Massillon Foundry & Machine Co., Massillon, O.
 Michigan Press Co., Ypsilanti, Mich.
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 Perkins Machine Co., Warren, Mass.
 Robinson Mfg. Co., J. M., Cincinnati, O.
 Rockford Iron Works, Rockford, Ill.
 Standard Machinery Co., Auburn, R. I.
 Stoll Co., D. H., 26 Lansing St., Buffalo, N. Y.
 TOLEDO MACHINE & TOOL CO., Toledo, O... *p.* 313
 TORRINGTON MFG. CO., Torrington, Conn... *p.* 483
 V & O Press Co., Glendale, L. I., N. Y.
 Walsh Press & Die Co., 4700 W. Kinzie St., Chicago, Ill.
 Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
 Willard Machine & Tool Co., Cincinnati, O.
 WILLIAMS-WHITE & CO., Moline, Ill... *p.* 314
 Zeh & Hahnemann Co., Ave. A & Vanderpool St., Newark, N. J.
—Printing
 American Type Founders Co., 300 Communipaw Ave., Jersey City, N. J.
 Hoe & Co., R., 504-520 Grand St., New York
 Stokes & Smith Co., Summerdale, Philadelphia, Pa.
 Whitlock Printing Press Mfg. Co., Derby, Conn.
—Punching and Trimming
 BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *p.* 310, 311
 Cleveland Punch & Shear Works Co., Cleveland, Ohio
 Enterprise Machinery Co., 34 S. Clinton St., Chicago, Ill.
 Ferracute Machine Co., Bridgeton, N. J.
 Heartley Machine, Variety Iron & Tool Works, Summit & Locust Sts., Toledo, O.
 LONG & ALLSTATTER CO., Hamilton, O... *p.* 309
 Massillon Foundry & Machine Co., Massillon, O.
 NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y... *p.* 312
 NILES-BEMENT-POND CO., 111 Broadway, New York... *p.* 344
 Partridge, E. O., 2047-2049 W. Lake St., Chicago, Ill.
 *ROVERS FORD FOUNDRY & MACHINE CO., 52 N. 5th St., Philadelphia, Pa... *pp.* 228, 229

Pre

PRESSES (Continued)**—Punching and Trimming**

SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa...*p.*
456

TOLEDO MACHINE & TOOL CO., Toledo,
O...*p.* 313

V & O Press Co., Glendale, L. I., N. Y.

WILLIAMS, WHITE & CO., Moline, Ill...*p.*
314

WOOD & CO., R. D., Philadelphia, Pa...*p.* 458

—Screw

BLISS CO., E. W., 19 Adams St., Brooklyn, N.
Y...*pp.* 310, 311

Perkins Machine Co., Warren, Mass.

TOLEDO MACHINE & TOOL CO., Toledo,
O...*p.* 313

United Engine & Mfg. Co., Hanover, Pa.

Zeh & Hahnemann Co., Ave. A & Vanderpool
St., Newark, N. J.

—Sheet Metal Working

BLISS CO., E. W., 19 Adams St., Brooklyn, N.
Y...*pp.* 310, 311

Ferracute Machine Co., Bridgeton, N. J.

McDonald Machine Co., 32nd & Shields Sts.,
Chicago, Ill.

NIAGARA MACHINE & TOOL WORKS, Buf-
falo, N. Y...*p.* 312

TOLEDO MACHINE & TOOL CO., Toledo,
O...*p.* 313

WILLIAMS, WHITE & CO., Moline, Ill...*p.*
314

—Stamping

BLISS CO., E. W., 19 Adams St., Brooklyn, N.
Y...*pp.* 310, 311

Ferracute Machine Co., Bridgeton, N. J.

McCall Machine Works, Rochester, N. Y.

Mason Machine Co., Inc., Jos. M., 2305 N.
Marshall St., Philadelphia, Pa.

TOLEDO MACHINE & TOOL CO., Toledo,
O...*p.* 313

V & O Press Co., Glendale, L. I., N. Y.

WILLIAMS, WHITE & CO., Moline Ill...*p.*
314

—Wheel (Hydraulic)

BURROUGHS CO., CHARLES, Newark, N. J.
p. 454

Chambersburg Engineering Co., Chambersburg,
Pa.

GALLAND-HENNING MFG. CO., 26th-27th
Ave. & Layton Park, Milwaukee, Wis...*p.* 455

Louie Mfg. Co., Springfield, Ill.

Metalwood Mfg. Co., Leib & Wight Sts., De-
troit, Mich.

NILES-BEMENT-POND CO., 111 Broadway,
New York...*p.* 344

SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa...*p.*
456

WATSON-STILLMAN CO., 35 Church St.,
New York...*p.* 457

WOOD & CO., R. D., Philadelphia, Pa...*p.* 458

PRESSURE INDICATORS, REGULATORS,**ETC.**

(See Indicators, Regulators, etc., Pressure)

PRINTERS' MACHINERY

Morgans & Willcox Mfg. Co., Middletown, N. Y.

Oswego Machine Works, Oswego, N. Y.

PRODUCERS, GAS

Amsler Gas Power Co., Wabash Bldg., Pitts-
burgh, Pa.

Chapman Engineering Co., 11 Broadway, New
York

Cooper Co., C. & G., Mt. Vernon, O.

Duff Patents Co., Inc., 918 Frick Bldg., Pitts-
burgh, Pa.

General Reduction, Gas & By-Products Co., 49
Wall St., New York

International Clay Machinery Co., 1057 Boh-
lander Ave., Dayton, O.

JACOBSON ENGINEERING CO., Albany, N.
Y...*p.* 31

MARSHALL FOUNDRY CO., 1st National

Bank Bldg., Pittsburgh, Pa...*p.* 496

MILWAUKEE RELIANCE BOILER WORKS.
Milwaukee, Wis...*p.* 112

Morgan Construction Co., Worcester, Mass.

NELSON BLOWER & FURNACE CO., 11
Elkins St., Boston, Mass...*p.* 67

Smith Gas Engineering Co., Worcester, Mass.

Syracuse Industrial Gas Co. (Syracuse), 206
McCarthy Bldg., Syracuse, N. Y.

WELLMAN-SEEVER-MORGAN CO., 7000
Central Ave., Cleveland, O...*p.* 272

***WESTINGHOUSE ELECTRIC & MFG. CO.**,
East Pittsburgh, Pa...*pp.* 114, 115

WOOD & CO., R. D., Philadelphia, Pa...*p.* 458

***WORTHINGTON PUMP & MACHINERY**
CORP'N, 115 Broadway, New York...*pp.* 30,
117, 431, 447

—Hand Operated

Chapman Engineering Co., 11 Broadway, New
York

MILWAUKEE RELIANCE BOILER WORKS.
Milwaukee, Wis...*p.* 112

—Suction

Amsler Gas Power Co., Wabash Bldg., Pitts-
burgh, Pa.

MILWAUKEE RELIANCE BOILER WORKS.
Milwaukee, Wis...*p.* 112

Syracuse Industrial Gas Co. (Syracuse), 206
McCarthy Bldg., Syracuse, N. Y.

WOOD & CO., R. D., Philadelphia, Pa...*p.* 458

PROFILING MACHINES

American Watch Tool Co., Waltham, Mass.

Luster-Jordan Co., Inc., W. Washington, Nor-
ristown, Pa.

PRATT & WHITNEY CO., 111 Broadway,
New York...*p.* 344

PROJECTILE MACHINES

Bryant Co., 58th & Filmore Sts., Chicago, Ill.

PROPELLERS

Columbian Bronze Corp'n, 50 Church St., New
York

PULLEY COVERING

(See Coverings, Pulley)

PULLEYS**—Cork Insert**

Cork Insert Co., 164 Federal St., Boston, Mass.

—Friction Clutch

AMERICAN TOOL & MACHINE CO., Bos-
ton, Mass...*p.* 490

Bauroth Brothers, Springfield, O.

Blevney Machine Co., Greenfield, Mass.

***CALDWELL & SON CO.**, H. W., 17th St. &
Western Ave., Chicago, Ill...*p.* 250

CALDWELL CO., INC., W. E., 340 E. Brandeis
St., Louisville, Ky...*p.* 201

Conway & Co., Brighton, Cincinnati, O.

DODGE SALES & ENGINEERING CO.
Mishawaka, Ind...*pp.* 202, 203, 204, 205, 206

Eastern Machinery Co., New Haven, Conn.

Edgemont Machine Co., Dayton, O.

***FALLS CLUTCH & MACHINERY CO.**
Cuyahoga Falls, O...*p.* 207

Fremont Clutch Co., Fremont, O.

Hanson Clutch & Machinery Co., Tiffin, O.

Havana Mfg. Co., Havana, Ill.

Hess-Snyder Co., Massillon, O.

***HILL CLUTCH CO.**, Cleveland, O...*p.* 208

JONES FOUNDRY & MACHINE CO., W. A.,
4401 W. 12th St., Chicago, Ill...*p.* 194

***LINK-BELT CO.**, 39th St. & Stewart Ave.,
Chicago, Ill...*p.* 256

McMahon & Co., Worcester, Mass.

MUNCIE OIL ENGINE CO., 500 American
Blvd., Muncie, Ind...*p.* 29

REEVES PULLEY CO., Columbus, Ind...*p.*
210

Skillin & Richards Mfg. Co., 4520 Cortland St.,
Chicago, Ill.

***WOOD'S SONS CO.**, T. B., Chambersburg,
Pa...*pp.* 212, 213

—Governor

***FALLS CLUTCH & MACHINERY CO.**
Cuyahoga Falls, O...*p.* 207

Pre

MECHANICAL EQUIPMENT DIRECTORY

-Iron

American Tool & Machine Co., Boston, Mass...
p. 490

*BROWN CO., A. & F., 79 Barclay St., New York... p. 187

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... p. 250

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky... p. 201

California Belting Co., Inc., 1459-61-63 Mission St., San Francisco, Cal.

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis... pp. 118, 119

Christiana Machine Co., Christiana, Pa.

*CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Chicago, Ill... p. 268

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 202, 203, 204, 205, 206

Edgemont Machine Co., Dayton, O.

Ehrsam & Sons Mfg. Co., J. B., Enterprise, Kan.

*FALLS CLUTCH & MACHINERY CO., Cuyahoga Falls, O... p. 207

Fess-Snyder Co., Massillon, O.

*HILL CLUTCH CO., Cleveland, O... p. 208

*HUNT MACHINE CO., Rodney, Orange, Mass... p. 449

ONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... p. 194

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... p. 256

Medart Patent Pulley Co., St. Louis, Mo.

Minster Machine Co., Minster, O.

Naylor Bros., Peekskill, N. Y.

Nordyke & Marmon Co., Indianapolis, Ind.

POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md... pp. 196, 197

*Pott Co., North Ave. & Noble St., Chicago, Ill.

Standard Pulley Co., 1734 Powers St., Cincinnati, O.

VELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... pp. 258, 259, 260

WOOD'S SONS CO., T. B., Chambersburg, Pa... pp. 212, 213

-Iron (Cork Insert)

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 202, 203, 204, 205, 206

-Motor

American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa... p. 200

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 202, 203, 204, 205, 206

FALLS CLUTCH & MACHINERY CO., Cuyahoga Falls, O... p. 207

HILL CLUTCH CO., Cleveland, O... p. 208

ONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... p. 194

Keasey Mfg. Co. (Reliance), Fostoria, O.

OHIO VALLEY PULLEY WORKS, Maysville, Ky... p. 211

Iney & Warrin, 406-412 Broome St., New York

Saginaw Mfg. Co. (Gilbert), Saginaw, Mich.

WOOD'S SONS CO., T. B., Chambersburg, Pa... pp. 212, 213

-Paper

ONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... p. 194

Rockwood Mfg. Co., Indianapolis, Ind.

-Steel

AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa... p. 200

CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... p. 250

ALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky... p. 201

CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn... p. 268

Rock, Ltd., R. & J., Passaic, N. J.

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 202, 203, 204, 205, 206

Edgemont Machine Works, Elmira, N. Y.

ONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... p. 194

Medart Patent Pulley Co., St. Louis, Mo.

Hillips Pressed Steel Pulley Works, Chestnut Hill, Pa.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... pp. 258, 259, 260

WORCESTER PRESSED STEEL CO., Worcester, Mass... p. 305

-Wood

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... p. 250

Detroit Pulley Co. (Paul), 1331 Bellevue Ave., Detroit, Mich.

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 202, 203, 204, 205, 206

Eclipse Wood Pulley Co., Inc., Berlin, Pa.

Excelsior Pulley Co., Inc., Cuba, N. Y.

Forster Co., John M., 110 Mill St., Rochester, N. Y.

JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill... p. 194

Keasey Mfg. Co. (Reliance), Fostoria, O.

Medart Patent Pulley Co., St. Louis, Mo.

Menasha Wood Split Pulley Co., Menasha, Wis.

OHIO VALLEY PULLEY WORKS, Maysville, Ky... p. 211

Oneida Wood Pulley Co., Oneida, N. Y.

Reading Wood Pulley Co., 11th & Muhlenberg Sts., Reading, Pa.

REEVES PULLEY CO., Columbus, Ind... p. 210

Saginaw Mfg. Co. (Gilbert), Saginaw, Mich.

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... pp. 258, 259, 260

-Wood (Iron Center)

Keasey Mfg. Co. (Reliance), Fostoria, O.

OHIO VALLEY PULLEY WORKS, Maysville, Ky... p. 211

Reading Wood Pulley Co., 11th & Muhlenberg Sts., Reading, Pa.

REEVES PULLEY CO., Columbus, Ind... p. 210

Saginaw Mfg. Co. (Gilbert), Saginaw, Mich.

-Wood (Step Cone)

Excelsior Pulley Co., Inc., Cuba, N. Y.

-Wood (Taper Cone)

Excelsior Pulley Co., Inc., Cuba, N. Y.

PULP MACHINERY

(See Paper Pulp Machinery)

PULVERIZERS

*BROWN CO., A. & F., 79 Barclay St., New York... p. 187

Hardinge Conical Mill Co., 120 Broadway, New York

Holmes & Blanchard Co., 31 State St., Boston, Mass.

Jeffrey Mfg. Co., 904 North Fourth St., Columbus, Ohio

K-B Pulverizer Co., Inc., 86 Worth St., New York

*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York... p. 93

Raymond Bros. Impact Pulverizer Co., 1315 N. Branch St., Chicago, Ill.

Standard Equipment Co., New Haven, Conn.

Sturtevant Mill Co., Harrison Sq., Boston, Mass.

-Cement Materials

BARTLETT & SNOW CO., C. O., Cleveland, O... p. 249

Bradley Pulverizer Co., Allentown, Pa.

*FULLER-LEHIGH CO., Fullerton, Pa... p. 92

STROUD & CO., E. H., 928-834 Fullerton Ave., Chicago, Ill... p. 466, 467

Sturtevant Mill Co., Harrison Sq., Boston, Mass.

*WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill... pp. 468, 469

-Coal

Aero Pulverizer Co., 120 Broadway, New York

BARTLETT & SNOW CO., C. O., Cleveland, O... p. 249

BONNOT CO., Canton, O... p. 464

*FULLER-LEHIGH CO., Fullerton, Pa... p. 92

Johnson Engineering Works, First National Bank Bldg., Chicago, Ill.

Mashek Engineering Co., 90 West St., New York

Pul

PULVERIZERS (Continued)**—Coal**

Pennsylvania Crusher Co., Stephen Girard Bldg., Philadelphia, Pa.
 STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . pp. 466, 467
 *WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill. . . pp. 468, 469

—Limestone

BARTLETT & SNOW CO., C. O., Cleveland, O. . . p. 249
 BONNOT CO., Canton, O. . . p. 464
 Bradley Pulverizer Co., Allentown, Pa.
 *FULLER-LEHIGH CO., Fullerton, Pa. . . p. 92
 Pennsylvania Crusher Co., Stephen Girard Bldg., Philadelphia, Pa.
 STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . pp. 466, 467
 *WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill. . . pp. 468, 469

—Phosphate Rock

BARTLETT & SNOW CO., C. O., Cleveland, O. . . p. 249
 BONNOT CO., Canton, O. . . p. 464
 Bradley Pulverizer Co., Allentown, Pa.
 *FULLER-LEHIGH CO., Fullerton, Pa. . . p. 92
 STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . pp. 466, 467
 Sturtevant Mill Co., Harrison Sq., Boston, Mass.

—Refractory Materials

BARTLETT & SNOW CO., C. O., Cleveland, O. . . p. 249
 *FULLER-LEHIGH CO., Fullerton, Pa. . . p. 92
 ST. JOHN GRATE BAR CO., Machinery Dept., The Bourse, Philadelphia, Pa. . . p. 90

Pul PULVERIZING AND AIR SEPARATING MACHINERY

BONNOT CO., Canton, O. . . p. 464
 Bradley Pulverizer Co., Allentown, Pa.
 *FULLER-LEHIGH CO., Fullerton, Pa. . . p. 92
 Gruendler Patent Crusher & Pulverizer Co., 924 N. First St., St. Louis, Mo.
 Raymond Bros. Impact Pulverizer Co., 1315 N. Branch St., Chicago, Ill.
 STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. . . pp. 466, 467
 *WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill. . . pp. 468, 469

PUMP GOVERNORS, LINERS, VALVES, ETC.

(See Governors, Liners, Valves, etc., Pump)

PUMPING ENGINES

(See Engines, Pumping)

PUMPING OUTFITS

American Oil Pump & Tank Co., Findley & Dalton Sts., Cincinnati, O.
 Bond Co., Harold L., 383-391 Atlantic Ave., Boston, Mass.
 Hinman & Co., D. A., Sandwich, Ill.
 Ideal Engine Co., Lansing, Mich.
 National Supply Co., 136 Huron St., Toledo, O.
 NOVO ENGINE CO., Lansing, Mich. . . pp. 444, 445
 Rider-Ericsson Engine Co., 20 Murray St. New York

PUMPS**—Acid**

American Hard Rubber Co., 11 Mercer St., New York
 Chemical Pump & Valve Co., 327 Gifford St., Perth Amboy, N. J.

—Air

(See Pumps, Vacuum)

—Air Lift Separator

Indiana Air Pump Co., 812 K. of P. Bldg., Indianapolis, Ind.
 INGERSOLL-RAND CO., 11 Broadway, New York. . . pp. 428, 429
 SULLIVAN MACHINERY CO., 121 S. Michigan Ave., Chicago, Ill. . . p. 430
 Weber Subterranean Pump Co., 50 E. 42nd St. New York

—Ammonia

Blackmer Rotary Pump Co., Petoskey, Mich.
 DE LAVAL STEAM TURBINE CO., Trenton, N. J. . . p. 22
 *DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York. . . p. 28
 DEMING CO., Salem, O. . . p. 440
 VOGT MACHINE CO., HENRY, Louisville, Ky. . . p. 63
 *WORTHINGTON PUMP & MACHINERY CORP'N, 111 Broadway, New York. . . pp. 30, 117, 431, 447

—Beer

DEMING CO., Salem, O. . . p. 440
 EPPING-CARPENTER PUMP CO., Pittsburgh, Pa. . . p. 441
 PLATT IRON WORKS, Dayton, O. . . p. 446

—Bilge (Rotary)

Blackmer Rotary Pump Co., Petoskey, Mich.
 Chicago Pump Co., 904-10 W. Lake St., Chicago, Ill.

—Boiler Feed

Advance Pump & Compressor Co., Battle Creek, Mich.
 ALDRICH PUMP CO., Allentown, Pa. . . p. 43
 American Steam Pump Co., Battle Creek, Mich.

Binghamton Machine Works, 38 Chenango St., Binghamton, N. Y.
 Boyts, Porter & Co., Connellsville, Pa.
 CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York. . . p. 439
 COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass. . . pp. 76, 77
 Davidson Co., M. T., 154 Nassau St., New York
 DE LAVAL STEAM TURBINE CO., Trenton, N. J. . . p. 22

DEMING CO., Salem, O. . . p. 440
 Douglas, W. & B., Middletown, Conn.
 EPPING-CARPENTER PUMP CO., Pittsburgh, Pa. . . p. 441
 Gardner Governor Co., Quincy, Ill.
 Hall Steam Pump Co., Pittsburgh, Pa.
 Locomotive Feed Water Heater Co., 30 Church St., New York

Lucey Mfg. Corp'n, Woolworth Bldg., New York
 McGowan Co., John H., Cincinnati, O.
 *MORRIS MACHINE WORKS, Baldwinville, N. Y. . . pp. 442, 443

Nash Engineering Co. (Jennings), South Norwalk, Conn.
 National Steam Pump Co., Upper Sandusky, O.
 Park Mfg. Co., Charlotte, N. C.
 PELTON WATER WHEEL CO., Harrison & 19th Sts., San Francisco, Cal. . . p. 452
 PLATT IRON WORKS, Dayton, O. . . p. 446
 Reilly Mfg. Co., J. J., 119 N. 10th St., Louisville, Ky.
 Rumsey Pump Co., Ltd., Seneca Falls, N. Y.
 SANDUSKY FOUNDRY & MACHINE CO., Sandusky, O. . . p. 488

Wagner Steam Pump Co., Canton, O.
 *WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York. . . pp. 30, 117, 431, 447

—Centrifugal

Adkins, Young & Allen Co., 561 W. Washington Blvd., Chicago, Ill.
 Advance Pump & Compressor Co., Battle Creek, Mich.
 Alberger Pump & Condenser Co. (Alberger), 140 Cedar St., New York
 *ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. . . p. 15

American Steam Pump Co., Battle Creek, Mich.
 American Well Works, Aurora, Ill.
 Bagley & Sewall Co., Watertown, N. Y.
 Black-Clawson Co., Hamilton, O.
 Buffalo Steam Pump Co., 490 Broadway, Buffalo, N. Y.
CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York... *p. 439*
 Carthage Machine Co., Carthage, N. Y.
 Castle Engineering Co., Inc., A. M., LaCrosse, Wis.
 Columbus Steam Pump Works, P. O. Box 394, Columbus, O.
COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass... *pp. 76, 77*
***CRAMP & SONS SHIP & ENGINE BLDG. CO.**, WM. (I. P. Morris Dept.), Richmond & Norris Sts., Philadelphia, Pa... *pp. 450, 451*
 Dallett, W. P., 49 N. 7th St., Philadelphia, Pa.
 Dayton-Dick Co., Quincy, Ill.
 Dayton Turbine Pump Co., N. 4th & Cuyahoga Aves., Cleveland, O.
DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*
 D'Oliver Centrifugal Pump & Machine Co., Morris Bldg., Philadelphia, Pa.
 Dow Pump & Dissel Engine Co., Alameda, Cal.
 Earle Gear & Machine Co. (Earle), Stenton & Wyoming Aves., Wayne Junction, Philadelphia, Pa.
 Economy Pumping Machinery Co., 116 N. Carpenter St., Chicago, Ill.
EPPING-CARPENTER PUMP CO., Pittsburgh, Pa... *p. 44*
 Erwin & Co., 3734 Cottage Grove Ave., Chicago, Ill.
 Fulfo Pump Co., Blanchester, Ohio
 Fulton Machine & Vise Co., Louisville, N. Y.
 Goldie & McCulloch Co., Ltd., Galt, Ont., Canada
 Goulds Mfg. Co., Seneca Falls, N. Y.
 Hill Pump Co., Anderson, Ind.
 Holland Machine Co., 132 Water St., South Norwalk, Conn.
***HUNT MACHINE CO., RODNEY**, Orange, Mass... *p. 449*
 Inglis Co., Ltd., John, Toronto, Ont., Canada
 Jackson Iron Works, 357 Market St., San Francisco, Cal.
 Kerr Machinery Corp'n, Detroit, Mich.
 Kingsford Foundry & Machine Works, Oswego, N. Y.
***LAMBERT & MANN CO.**, Wood & Walnut Sts., Chicago, Ill... *p. 448*
 Lawrence & Co., L., 290 Halsey St., Newark, N. J.
 Lawrence Machine Co., Lawrence, Mass.
 Lawrence Pump & Engine Co., Lawrence, Mass.
 Lea-Courtenay Co., 90 West St., New York
 Lucey Mfg. Corp'n, Woolworth Bldg., New York
 Manistee Iron Works Co., Manistee, Mich.
***MORRIS MACHINE WORKS**, Baldwinville, N. Y... *pp. 442, 443*
NOVO ENGINE CO., Lansing, Mich... *pp. 444, 445*
 Oliver Mfg. Co., Fourth & Madison Sts., Oakland, Cal.
PELTON WATER WHEEL CO., Harrison & 19th Sts., San Francisco, Cal... *p. 452*
PLATT IRON WORKS, Dayton, O... *p. 446*
 Price Pump & Engine Co., G. W., 33 Stevenson St., San Francisco, Cal.
 Rumsey Pump Co., Ltd., Seneca Falls, N. Y.
 Savage & Love Co., 710 S. Main St., Rockford, Ill.
 Scranton Pump Co., Scranton, Pa.
 Sprado Engineering Co., c/o American Bank Bldg., Los Angeles, Cal.
 Standard Oil Engine Co., 130 Seaview Ave., Bridgeport, Conn.
 Swaby Mfg. Co., 2010 Marshall Blvd., Chicago, Ill.
 Taber Pump Co., 291-297 Elm St., Buffalo, N. Y.
 Tampa Shipbuilding & Engineering Co., Tampa, Fla.

Toledo Foundry & Machine Co., Toledo, O.
 Turbine Equipment Co., 50 Church St., New York
 Twinvolute Pump & Mfg. Co., 216-228 High St., Newark, N. J.
 Union Steam Pump Co., Battle Creek, Mich.
 United Iron Works, Oakland, Cal.
 Universal Motor Co., Oshkosh, Wis.
 Weinman Pump Mfg. Co., Columbus, O.
WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J... *p. 116*
 Wilson-Snyder Mfg. Co., 2-18 Ross St., Pittsburgh, Pa.
WOOD & CO., R. D., Philadelphia, Pa... *p. 458*
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York... *pp. 30, 117, 431, 447*
 Yeomans Bros. Co., Jeffrey Bldg., Chicago, Ill.
 Yuba Mfg. Co., Marysville, Cal.
 Zin-Ho Brunner Fdry. & Mch. Co., 343 So. Dearborn St., Chicago, Ill.
 —**Condensation (with Automatic Receiver)**
 Chicago Pump Co., 904-10 W. Lake St., Chicago, Ill.
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York... *pp. 30, 117, 431, 447*
 —**Deep Well**
 American Steam Pump Co., Battle Creek, Mich.
 American Well Works, Aurora, Ill.
 Bradford Motor Works, Bradford, Pa.
CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York... *p. 439*
 Cook, A. D., Lawrenceburg, Ind.
DEMING CO., Salem, O... *p. 440*
 Douglas, W. & B., Middletown, Conn.
EPPING-CARPENTER PUMP CO., Pittsburgh, Pa... *p. 441*
 Fort Wayne Engineering & Mfg. Co. (Paul), Fort Wayne, Ind.
 Jackson Iron Works, 357 Market St., San Francisco, Cal.
 Keystone Driller Co., Beaver Falls, Pa.
 Layne & Bowler Co., 6th & Girard Sts., Houston, Texas
 Luitwieler Pumping Engine Co., 123 Ames St., Rochester, N. Y.
 McGowen Co., John H., Cincinnati, O.
NOVO ENGINE CO., Lansing, Mich... *pp. 444, 445*
PELTON WATER WHEEL CO., Harrison & 19th Sts., San Francisco, Cal... *p. 452*
 Rumsey Pump Co., Ltd., Seneca Falls, N. Y.
 Sprado Engineering Co., c/o American Bank Bldg., Los Angeles, Cal.
 Weinman Pump Mfg. Co., Columbus, O.
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York... *pp. 30, 117, 431, 447*
 —**Diaphragm**
DEMING CO., Salem, O... *p. 440*
 Domestic Engine & Pump Co., Shippensburg, Pa.
 Edison Mfg. Co., 257 Atlantic Ave., Boston, Mass.
NOVO ENGINE CO., Lansing, Mich... *pp. 444, 445*
 —**Dredging**
***MORRIS MACHINE WORKS**, Baldwinville, N. Y... *pp. 442, 443*
 Swaby Mfg. Co., 2010 Marshall Blvd., Chicago, Ill.
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York... *pp. 30, 117, 431, 447*
 —**Dry Vacuum**
 (See Pumps, Vacuum)
 —**Electric**
ALDRICH PUMP CO., Allentown, Pa... *p. 438*
CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York... *p. 439*
 Dallett, W. P., 9 N. 7th St., Philadelphia, Pa.
DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*

Pum

See Catalogue Section for data of firms listed in capital type

PUMPS (Continued)**—Electric**

DEMING CO., Salem, O. . . *p. 440*
 Douglas, W. & B., Middletown, Conn.
 EPPING-CARPENTER PUMP CO., Pitts-
 burgh, Pa. . . *p. 441*
 Erwin & Co., 3734 Cottage Grove Ave., Chicago,
 Ill.
 Goulds Mfg. Co., Seneca, N. Y.
 Ives Mfg. Co., Baltimore, Md.
 Lawrence Machine Co., Lawrence, Mass.
 Lawrence Pump & Engine Co., Lawrence, Mass.
 Luitwieler Pumping Engine Co., 123 Ames St.,
 Rochester, N. Y.
 McGowan Co., John H., Cincinnati, O.
 *MORRIS MACHINE WORKS, Baldwins-
 ville, N. Y. . . *pp. 442, 443*
 Peters Pump Co., Kewanee, Ill.
 PLATT IRON WORKS, Dayton, O. . . *p. 446*
 Prescott Co., Menominee, Mich.
 Quimby, Inc., William E., 209 Parkhurst St.,
 Newark, N. J.
 Rumsey Pump Co., Ltd., Seneca Falls, N. Y.
 Scranton Pump Co., Scranton, Pa.
 Standard Pump & Engine Co., Akron, O.
 WOOD & CO., R. D., Philadelphia, Pa. . . *p. 458*
 *WORTHINGTON PUMP & MACHINERY
 CORP'N, 115 Broadway, New York. . . *pp.*
30, 117, 431, 447
 Yeomans Bros. Co., Jeffrey Bldg., Chicago, Ill.

—Elevator

American Steam Pump Co., Battle Creek, Mich.
 CAMERON STEAM PUMP WORKS, A. S.,
 11 Broadway, New York. . . *p. 439*
 Davidson Co., M. T., 154 Nassau St., New York
 DE LAVAL STEAM TURBINE CO., Trenton,
 N. J. . . *p. 22*
 DEMING CO., Salem, O. . . *p. 440*
 EPPING-CARPENTER PUMP CO., Pitts-
 burgh, Pa. . . *p. 441*
 McGowan Co., John H., Cincinnati, O.
 *MORRIS MACHINE WORKS, Baldwins-
 ville, N. Y. . . *pp. 442, 443*
 PLATT IRON WORKS, Dayton, O. . . *p. 446*
 *WORTHINGTON PUMP & MACHINERY
 CORP'N, 115 Broadway, New York. . . *pp.*
30, 117, 431, 447

—Filtration

Connersville Blower Co., Connersville, Ind.
—Fire
 CAMERON STEAM PUMP WORKS, A. S.,
 11 Broadway, New York. . . *p. 439*
 Dayton-Dick Co., Quincy, Ill.
 DE LAVAL STEAM TURBINE CO., Tren-
 ton, N. J. . . *p. 22*
 DEMING CO., Salem, O. . . *p. 440*
 *HUNT MACHINE CO., RODNEY, Orange,
 Mass. . . *p. 449*
 Lea-Courtenay Co., 90 West St., New York
 Lucas-Miner Pumps Co., Springfield, O.
 *MORRIS MACHINE WORKS, Baldwins-
 ville, N. Y. . . *pp. 442, 443*
 PLATT IRON WORKS, Dayton, O. . . *p. 446*

—Gas

Connersville Blower Co., Connersville, Ind.

—Gas Power

Hydraulic Gas Power Co., Foot So. Phelps St.,
 Youngstown, O.
 Kruger & Blind Co., 513 Master St., Philadelphia,
 Pa.
 NOVO ENGINE CO., Lansing, Mich. . . *pp.*
444, 445
 Lea-Courtenay Co., 90 West St., New York
 Lucas-Miner Pumps Co., Springfield, O.
 *MORRIS MACHINE WORKS, Baldwins-
 ville, N. Y. . . *pp. 442, 443*
 PLATT IRON WORKS, Dayton, O. . . *p. 446*

—Gasoline

Blackmer Rotary Pump Co., Petoskey, Mich.

—Hand

BURROUGHS CO., CHARLES, Newark, N.
 J. . . *p. 454*
 DEMING CO., Salem, O. . . *p. 440*
 Douglas, W. & B., Middletown, Conn.
 Dunning & Boschert Press Co., Inc., 331 West
 Water St., Syracuse, N. Y.
 Hazen Mfg. Co., Hudson, Mich.
 Myers & Bro., F. E., Ashland, O.

—Hydraulic Pressure

ALDRICH PUMP CO., Allentown, Pa. . . *p. 438*
 American Steam Pump Co., Battle Creek, Mich.
 Boyts, Porter & Co., Connellsville, Pa.
 BUCKEYE IRON & BRASS WORKS, Dayton
 O. . . *p. 481*
 BURROUGHS & CO., CHARLES, Newark
 N. J. . . *p. 454*
 Connersville Blower Co., Connersville, Ind.
 DE LAVAL STEAM TURBINE CO., Trenton,
 N. J. . . *p. 22*
 DEMING CO., Salem, O. . . *p. 440*
 Elmes Engineering Works, Chas. F., 215 N.
 Morgan St., Chicago, Ill.
 EPPING-CARPENTER PUMP CO., Pitts-
 burgh, Pa. . . *p. 441*
 GALLAND-HENNING MFG. CO., 26th-27th
 Ave. & Layton Park, Milwaukee, Wis. . .
455
 Gray Aldrich Co., Inc., 33 Commercial Wharf,
 Boston, Mass.
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio
 Latta-Martin Pump Co., Hickory, N. C.
 Logemann Bros. Co., 3120 Burleigh St., Mil-
 waukee, Wis.
 *MORRIS MACHINE WORKS, Baldwins-
 ville, N. Y. . . *pp. 442, 443*
 OLSEN TESTING MACHINE CO., TINIU'S,
 500 N. 12th St., Philadelphia, Pa. . . *p. 511*
 PLATT IRON WORKS, Dayton, O. . . *p. 446*
 RIEHL BROS. TESTING MACHINE CO.,
 1424 N. 8th St., Philadelphia, Pa. . . *p. 512*
 Robertson & Co., John, 133 Water St., Brook-
 lyn, N. Y.
 Rumsey Pump Co., Ltd., Seneca Falls, N. Y.
 Wilson-Snyder Mfg. Co., 2-18 Ross St., Pitts-
 burgh, Pa.
 WATSON-STILLMAN CO., 35 Church St.,
 New York. . . *p. 457*
 *WORTHINGTON PUMP & MACHINERY
 CORP'N, 115 Broadway, New York. . . *pp.*
30, 117, 431, 447

—Irrigation

Hydraulic Gas Power Co., Foot So. Phelps St.,
 Youngstown, O.
 Viking Pump Co., Cedar Falls, Ia.
 WHEELER CONDENSER & ENGINEERING
 CO., Carteret, N. J. . . *p. 116*

—Lift and Force

DEMING CO., Salem, O. . . *p. 440*
 Hazen Mfg. Co., Hudson, Mich.
 Luitwieler Pumping Engine Co., 123 Ames St.,
 Rochester, N. Y.
 Mast, Foos & Co., Springfield, O.
 Myers & Bro., F. E., Ashland, O.
 NOVO ENGINE CO., Lansing, Mich. . . *pp.*
444, 445
 Ottumwa-Moline Engine & Pump Co., Ottumwa,
 Ia.

Rife Hydraulic Mfg. Co., 90 West St., New York

—Measuring (Gasoline or Oil)

Dayton Pump & Mfg. Co., 5th & Northwood
 Sts., Dayton, O.
 MORRISON BROS., Duquesne, Ia. . . *p. 495*
 RICHARDSON-PHENIX CO., 126 Reservoir
 Ave., Milwaukee, Wis. . . *pp. 170-171*

—Mine

ALDRICH PUMP CO., Allentown, Pa. . . *p. 438*
 Blakeslee Mfg. Co., Du Quoin, Ill.
 Boyts, Porter & Co., Connellsville, Pa.
 CAMERON STEAM PUMP WORKS, A. S.,
 11 Broadway, New York. . . *p. 439*
 Crawford & McCrimmon Co., Brazil, Ind.
 DE LAVAL STEAM TURBINE CO., Trenton,
 N. J. . . *p. 22*
 DEMING CO., Salem, O. . . *p. 440*
 EPPING-CARPENTER PUMP CO., Pitts-
 burgh, Pa. . . *p. 441*
 Fairmont Mining Machinery Co., Fairmont, W.
 Va.
 Luitwieler Pumping Engine Co., 123 Ames St.,
 Rochester, N. Y.
 *MORRIS MACHINE WORKS, Baldwins-
 ville, N. Y. . . *pp. 442, 443*

National Steam Pump Co., Upper Sandusky, O.
Nye Steam Pump & Machinery Co., 701 N.
Western Ave., Chicago, Ill.
PLATT IRON WORKS, Dayton, O... *p. 446*
Swaby Mfg. Co., 2010 Marshall Blvd., Chicago,
Ill.
Weinman Pump Mfg. Co., Columbus, O.

—Oil

Atlas Brass Foundry Co., 980 S. Park St.,
Columbus, O.
*BEST, INC., W. N., 11 Broadway, New York...
p. 411
Blackmer Rotary Pump Co., Petoskey, Mich.
Bowser & Co., Inc., S. F., Ft. Wayne, Ind.
Butler Mfg. Co., 1326 Grand Ave., Kansas City,
Mo.
CAMERON STEAM PUMP WORKS, A. S.,
11 Broadway, New York... *p. 439*
DEMING CO., Salem, O... *p. 440*
EPPING-CARPENTER PUMP CO., Pitts-
burgh, Pa... *p. 441*
Fulflow Pump Co., Blanchester, Ohio.
Johnson Co., S. T., 1337 Mission St., San Fran-
cisco, Cal.
Kinney Mfg. Co., Jamaica Plains, Boston, Mass.
Kupferle Bros. Mfg. Co., 600 N. Second St.,
St. Louis, Mo.
Lobec Pump & Machinery Co., 111 Dearborn St.,
Buffalo, N. Y.
McDonald Mfg. Co., A. Y., Dubuque, Ia.
*MORRIS MACHINE WORKS, Baldwins-
ville, N. Y... *pp. 442, 443*
National Supply Co., 136 Huron St., Toledo, O.
National Transit Pump & Machine Co., Oil
City, Pa.
NOVO ENGINE CO., Lansing, Mich... *pp.*
444, 445
PLATT IRON WORKS, Dayton, O... *p. 446*
Quimby, Inc., William E., 209 Parkhurst St.,
Newark, N. J.
RICHARDSON-PHENIX CO., 126 Reservoir
Ave., Milwaukee, Wis... *pp. 170, 171*
SANDUSKY FOUNDRY & MACHINE CO.,
Sandusky, O... *p. 488*
TATE-JONES & CO., INC., Pittsburgh, Pa...
pp. 416, 417
Trahern Pump Co., 707 S. Main St., Rockford, Ill.
Viking Pump Co., Cedar Falls, Ia.
Wagner Steam Pump Co., Canton, O.
Wayne Oil Tank & Pump Co., Canal St., Fort
Wayne, Ind.
*WORTHINGTON PUMP & MACHINERY
CORP'N, 115 Broadway, New York... *pp.*
30, 117, 431, 447

—Oil (Force Feed)

*DOEHLER DIE-CASTING CO., Brooklyn,
N. Y... *p. 292*
*GREENE, TWEED & CO., 109 Duane St.,
New York... *p. 168*
Hills-McCanna Co., 153 W. Kinzie St., Chicago,
Ill.
Inter-State Machine Products Co., Rochester,
N. Y.
MADISON-KIPP LUBRICATOR CO., Madi-
son, Wis... *p. 172*
McCullough Mfg. Co., Minneapolis, Minn.
Manzel Bros. Co., 317 Babcock St., Buffalo,
N. Y.
PICKERING GOVERNOR CO., Portland,
Conn... *p. 166*
Sherwood Mfg. Co., 1702-1712 Elmwood Ave.,
Buffalo, N. Y.

—Oil (Hand)

LONERGAN CO., J. E., 211-215 Race St.,
Philadelphia, Pa... *pp. 127, 5 8*
Michigan Lubricator Co., 661 Beaubien St., De-
troit, Mich.
RICHARDSON-PHENIX CO., 126 Reservoir
St., Milwaukee, Wis... *pp. 170, 171*
Sherwood Mfg. Co., 1702-1712 Elmwood Ave.,
Buffalo, N. Y.

—Pneumatic Pressure

DEMING CO., Salem, O... *p. 440*

Fort Wayne Engineering & Mfg. Co., Fort
Wayne, Ind.
Latta-Martin Pump Co., Hickory, N. C.
Luitwieler Pumping Engine Co., 123 Ames St.,
Rochester, N. Y.
McDonald Mfg. Co., A. Y., Dubuque, Ia.

—Power

Advance Pump & Compressor Co., Battle Creek,
Mich.

ALDRICH PUMP CO., Allentown, Pa... *p. 438*

American Steam Pump Co., Battle Creek, Mich.

Buffalo Steam Pump Co., 490 Broadway, Buffalo,
N. Y.

CAMERON STEAM PUMP WORKS, A. S.,
11 Broadway, New York... *p. 439*

Columbus Steam Pump Works, P. O. Box 394,
Columbus, O.

Dallett, W. P., 49 N. 7th St., Philadelphia, Pa.

Dayton Pump & Mfg. Co., 5th & Northwood
Sts., Dayton, O.

Dean Bros. Steam Pump Works, Indianapolis,
Ind.

DEMING CO., Salem, O... *p. 440*

Douglas, W. & B., Middletown, Conn.

EPPING-CARPENTER PUMP CO., Pitts-
burgh, Pa... *p. 441*

Erwin & Co., 3734 Cottage Grove Ave., Chicago,
Ill.

GALLAND-HENNING MFG. CO., 26th-27th
Ave. & Layton Park, Milwaukee, Wis... *p.*
455

Goulds Mfg. Co., Seneca Falls, N. Y.

Kinney Mfg. Co., Jamaica Plain, Boston, Mass.

Lucas-Miner Pumps Co., Springfield, O.

Luitwieler Pumping Engine Co., 123 Ames St.,
Rochester, N. Y.

Lunt-Moss Co., 43 S. Market St., Boston, Mass.

McDonald Mfg. Co., A. Y., Dubuque, Ia.

McGowan Co., John H., Cincinnati, O.

Mast, Foos & Co., Springfield, O.

Matson Machine Co., Concord, N. H.

*MORRIS MACHINE WORKS, Baldwins-
ville, N. Y... *pp. 442, 443*

National Transit Pump & Machine Co., Oil
City, Pa.

NOVO ENGINE CO., Lansing, Mich... *pp.*
444, 445

Peters Pump Co., Kewanee, Ill.

PLATT IRON WORKS, Dayton, O... *p. 446*

SANDUSKY FOUNDRY & MACHINE CO.,
Sandusky, O... *p. 488*

Steiner & Co., M., 242 Torrence St., Dayton, O.

Stine Co., J. C., Tyrone, Pa.

WHEELER CONDENSER & ENGINEERING
CO., Carteret, N. J... *p. 116*

*WORTHINGTON PUMP & *MACHINERY
CORP'N, 115 Broadway, New York... *pp.*
30, 117, 431, 447

—Pulsometer

Pulsometer Steam Pump Co., Irvington, N. J.

—Rotary

Blackmer Rotary Pump Co., Petoskey, Mich.

Clothel Co., 61 Broadway, New York

Connorsville Blower Co., Connorsville, Ind.

DEMING CO., Salem, O... *p. 440*

Douglas, W. & B., Middletown, Conn.

Fulflow Pump Co., Blanchester, Ohio

*HUNT MACHINE CO., RODNEY, Orange,
Mass... *p. 449*

Kinney Mfg. Co., 3529 Washington St., Boston,
Mass.

*LAMBERT & MANN CO., Wood & Walnut
Sts., Chicago, Ill... *p. 448*

Lobec Pump & Machinery Co., 111 Dearborn St.,
Buffalo, N. Y.

Lombard Governor Co., Ashland, Mass.

NOVO ENGINE CO., Lansing, Mich... *pp.*
444, 445

Pittsburgh Machine Tool Co., Braddock, Pa.

RUMSEY PUMP CO., LTD., Seneca Falls, N. Y.

Sprado Engineering Co., c/o American Bank
Bldg., Los Angeles, Cal.

Taber Pump Co., 291-297 Elm St., Buffalo,
N. Y.

Pum

PUMPS (Continued)**—Rotary**

Trabern Pump Co., 707 S. Main St., Rockford, Ill.

Viking Pump Co., Cedar Falls, Ia.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa...*pp. 114, 115*

—Screw

Quimby, Inc., William E., 209 Parkhurst St., Newark, N. J.

—Seepage

Erwin & Co., 3734 Cottage Grove Ave., Chicago, Ill.

—Sewage

DE LAVAL STEAM TURBINE CO., Trenton, N. J...*p. 22*

DEMING CO., Salem, O...*p. 440*

EPPING-CARPENTER PUMP CO., Pittsburgh, Pa...*p. 441*

Kingsford Foundry & Machine Works, Oswego, N. Y.

Latta-Martin Pump Co., Hickory, N. C.

Lawrence Pump & Engine Co., Lawrence, Mass.

*MORRIS MACHINE WORKS, Baldwinville, N. Y...*pp. 442, 443*

Nye Steam Pump & Machinery Co., 701 N. Western Ave., Chicago, Ill.

Twinvolute Pump & Mfg. Co., 216-228 High St., Newark, N. J.

—Soap (Rotary)

Blackmer Rotary Pump Co., Petoskey, Mich.

DEMING CO., Salem, O...*p. 440*

Lobe Pump & Machinery Co., 111 Dearborn St., Buffalo, N. Y.

—Spray

DEMING CO., Salem, O...*p. 440*

Douglas, W. & B., Middletown, Conn.

—Steam

Pump Advance Pump & Compressor Co., Battle Creek, Mich.

Blake Pump & Condenser Co., Fitchburg, Pa.

Blakeslee Mfg. Co., DuQuoin, Ill.

Buffalo Steam Pump Co., 490 Broadway, Buffalo, N. Y.

CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York...*p. 439*

Columbus Steam Pump Works, P. O. Box 394, Columbus, O.

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Davidson Co. M. T., 154 Nassau St., New York

Dean Bros. Steam Pump Works, Indianapolis, Ind.

DuBois Iron Works, 805 Brady St., DuBois, Pa.

Emerson Pump & Valve Co., Inc., Alexandria, Va.

EPPING-CARPENTER PUMP CO., Pittsburgh, Pa...*p. 441*

Godfrey, Keeler Co., 70 Warren St., New York

Guild & Garrison, 457 Kent Ave., Brooklyn, N. Y.

Hill Pump Co., Anderson, Ind.

Jamieson, M. W., P. O. Box 827, Warren, Pa.

Kerr Machinery Corp'n, Detroit, Mich.

McGowan Co., John H., Cincinnati, O.

*MORRIS MACHINE WORKS, Baldwinville, N. Y...*pp. 442, 443*

National Transit Pump & Machine Co., Oil City, Pa.

Nye Steam Pump & Machinery Co., 701 N. Western Ave., Chicago, Ill.

PLATT IRON WORKS, Dayton, O...*p. 446*

Pulsometer Steam Pump Co., Irvington, N. J.

Rearick, Charles B., 14 Wall St., New York

Reilly Mfg. Co., J. J., 119 N. 10th St., Louisville, Ky.

Scranton Pump Co., Scranton, Pa.

Union Steam Pump Co., Battle Creek, Mich.

Vogt Brothers Mfg. Co., 1402 W. Main St., Louisville, Ky.

Wagner Steam Pump Co., Canton, O.

Walker Mfg. Co., Fenton, Mich.

Warren Steam Pump Co., Warren, Mass.

Wells Steam Pump Works, F. C., 101 S. Clinton St., Chicago, Ill.

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p. 116*

Wilson-Snyder Mfg. Co., 2-18 Ross St., Pittsburgh, Pa.

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*

—Sugar House

American Steam Pump Co., Battle Creek, Mich.

Blackmer Rotary Pump Co., Petoskey, Mich.

CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York...*p. 439*

DEMING CO., Salem, O...*p. 440*

EPPING-CARPENTER PUMP CO., Pittsburgh, Pa...*p. 441*

Guild & Garrison, 457 Kent Ave., Brooklyn, N. Y.

*MORRIS MACHINE WORKS, Baldwinville, N. Y...*pp. 442, 443*

PLATT IRON WORKS, Dayton, O...*p. 446*

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*

—Tank

CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York...*p. 439*

COLE MFG. CO., R. D., Newnan, Ga...*p. 41*

DEMING CO., Salem, O...*p. 440*

Furness Bros. Co., 1615 W. Walnut St., Chicago, Ill.

Lucas-Miner Pumps Co., Springfield, O.

Luitwieler Pumping Engine Co., 123 Ames St., Rochester, N. Y.

*MORRIS MACHINE WORKS, Baldwinville, N. Y...*pp. 442, 443*

PLATT IRON WORKS, Dayton, O...*p. 446*

Reilly Mfg. Co., J. J., 119 N. 10th St., Louisville, Ky.

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p. 116*

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*

—Tar and Benzol

Connersville Blower Co., Connersville, Ind.

—Turbine

CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York...*p. 439*

Chicago Pump Co., 904-10 W. Lake St., Chicago, Ill.

COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass...*pp. 76, 77*

DE LAVAL STEAM TURBINE CO., Trenton, N. J...*p. 22*

EPPING-CARPENTER PUMP CO., Pittsburgh, Pa...*p. 441*

Jackson Iron Works, 357 Market St., San Francisco, Cal.

Kingsford Foundry & Machine Works, Oswego, N. Y.

*MORRIS MACHINE WORKS, Baldwinville, N. Y...*pp. 442, 443*

PELTON WATER WHEEL CO., Harrison & 19th Sts., San Francisco, Cal...*p. 452*

PLATT IRON WORKS, Dayton, O...*p. 446*

Rearick, Charles B., 14 Wall St., New York

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa...*pp. 114, 115*

WOOD & CO., R. D., Philadelphia, Pa...*p. 458*

*WORTHINGTON PUMP & MACHINERY CORP'N, 115 Broadway, New York...*pp. 30, 117, 431, 447*

—Vacuum

Abbé Engrg. Co., 220 Broadway, New York

American Steam Pump Co., Battle Creek, Mich.

Beach-Russ Co., 220 Broadway, New York

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa...*p. 539*

Bishop & Babcock Co., E. 49th & Hamilton Ave., Cleveland, Ohio

Black-Clawson Co., Hamilton, O.

*Advertisements of firms marked * appear in The Journal, A.S. M. E.*

Buffalo Foundry & Machine Co., E. Perry St. & Fillmore Ave., Buffalo, N. Y.
 Bury Compressor Co., Erie, Pa.
CAMERON STEAM PUMP WORKS, A. S., 11 Broadway, New York... *p. 439*
 Clark & Norton Mfg. Co., Wellsville, N. Y.
 Connorsville Blower Co., Connorsville, Ind.
CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*
 Crowell Mfg. Co., 206 Taaffe Place, Brooklyn, N. Y.
DEMING CO., Salem, O... *p. 440*
 Economy Pumping Machinery Co., 116 N. Carpenter St., Chicago, Ill.
 Emerson Pump & Valve Co., Inc., Alexandria, Va.
EPHING-CARPENTER PUMP CO., Pittsburgh, Pa... *p. 441*
 Guild & Garrison, 457 Kent Ave., Brooklyn, N. Y.
 Hall Steam Pump Co., Pittsburgh, Pa.
HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O... *pp. 48, 49, 321*
 Hubbard's Sons, Norman, 265 Water St., Brooklyn, N. Y.
INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*
 Kruger & Blind (Lebran), 513 Master St., Philadelphia, Pa.
***LAMBERT & MANN CO.,** Wood & Walnut St., Chicago, Ill... *p. 448*
 McGowan Co., John H., Cincinnati, O.
 Nagle Corliss Engine Works, Erie, Pa.
 Nash Engineering Co. (Hydroturbine), South Norwalk, Conn.
 National Steam Pump Co., Upper Sandusky, O.
 Pulsometer Steam Pump Co., Irvington, N. J.
 Rix Compressed Air & Drill Co., 505 Howard St., San Francisco, Cal.
 Roots Co., P. H. & F. M., Connorsville, Ind.
 Utility Compressor Co., 355 Harper Ave., E. Detroit, Mich.
 Viking Pump Co., Cedar Falls, Ia.
***WESTINGHOUSE ELECTRIC & MFG. CO.,** East Pittsburgh, Pa... *pp. 114, 115*
WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J... *p. 116*
 Wheeler Mfg. Co., C. H., Philadelphia, Pa.
WILBRAHAM-GREEN BLOWER CO., Pottstown, Pa... *p. 437*
WOOD & CO., R. D., Philadelphia, Pa... *p. 458*
 York Electric & Machine Co., 30-34 N. Penn St., York, Pa.
—Water Circulating (Engine)
 Fulfo Pump Co., Blanchester, Ohio
—Windmill
DEMING CO., Salem, O... *p. 440*
 Hazen Mfg. Co., Hudson, Mich.
 Myers & Bro., F. E., Ashland, O.
 Peters Pump Co., Kewanee, Ill.
 Stover Mfg. & Engine Co., Freeport, Ill.
 Trahern Pump Co., 707 S. Main St., Rockford, Ill.
PUNCH PRESS WORK
 Affa Specialty Co., 34 Southbridge St., Worcester, Mass.
PUNCHES
—Hydraulic
ALLIANCE MACHINE CO., Alliance, O... *p. 264*
 Henderer's Sons, A. L., Wilmington, Del.
SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p. 456*
WATSON-STILLMAN CO., 35 Church St., New York... *p. 457*
WOOD & CO., R. D., Philadelphia, Pa... *p. 458*
—Metal (Hand Power)
 Badger State Machine Co., Janesville, Wis.
 Lewthwaite Machine Co., T. H., 415 E. 31st St., New York
 Schatz Mfg. Co., Poughkeepsie, N. Y.

Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill.
—Multiple
BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*
LONG & ALLSTATTER CO., Hamilton, O... *p. 309*
NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y... *p. 312*
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*
SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p. 456*
 Thomas Spacing Machine Co., 1226 Fulton Bldg., Pittsburgh, Pa.
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*
—Power
 Badger State Machine Co., Janesville, Wis.
BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*
 Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
 Clark Foundry Co., Rumford, Me.
 Covington Machine Co., Covington, Va.
 Enterprise Machinery Co., 34 S. Clinton St., Chicago, Ill.
 Imperial Machine Co., 1611 Central Ave., Minneapolis, Minn.
NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y... *p. 312*
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*
PUNCHES AND DIES
BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*
 Cleveland Punch & Shear Works Co., Cleveland, O.
 Lewthwaite Machine Co., T. H., 415 E. 31st St., New York
 Nestor Mfg. Co., 40 W. 13th St., New York
PRATT & WHITNEY CO., 111 Broadway, New York... *p. 344*
 Richards Co., I. P., 23 Pemberton St., Providence, R. I.
SLOAN & CHACE MFG. CO., LTD., Sixth Ave., Cor. N. 13th St., Newark, N. J... *p. 357*
 Thomas Spacing Machine Co., 1226 Fulton Bldg., Pittsburgh, Pa.
TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*
TORRINGTON MFG. CO., Torrington, Conn... *p. 483*
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*
PUNCHING AND COPING MACHINES
 Ironton Punch & Shear Co., Ironton, O.
LONG & ALLSTATTER CO., Hamilton, O... *p. 309*
 Massillon Foundry & Machine Co., Massillon, O.
NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*
SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa... *p. 456*
WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*
PUNCHING AND SHEARING MACHINES
 Badger State Machine Co., Janesville, Wis.
BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*
 Covington Machine Co., Covington, Va.
 Excelsior Tool & Machine Co., East St. Louis, Mo.
 Hendley & Whittemore Co., Beloit, Wis.
 Hilles & Jones Co., Wilmington, Del.
 Ironton Punch & Shear Co., Ironton, O.
 Kane & Roach, Niagara & Shonnard Sts., Syracuse, N. Y.
 Kling Bros. Engineering Works, 1302-1332 N. Kostner Ave., Chicago, Ill.
LONG & ALLSTATTER CO., Hamilton, O... *p. 309*

Pun

See Catalogue Section for data of firms listed in capital type

PUNCHING AND SHEARING MACHINES
(Continued)

Massillon Foundry & Machine Co., Massillon, O.
 New Doty Mfg. Co., Hanesville, Wis.
 NIAGARA MACHINE & TOOL WORKS,
 Buffalo, N. Y., *p.* 312
 NILES-BEMENT-POND CO., 111 Broadway,
 New York... *p.* 344
 Pels & Co., Henry, 90 West St., New York
 Rock River Machine Co., Janesville, Wis.
 *ROVERS FORD FOUNDRY & MACHINE
 CO., 52 N. 5th St., Philadelphia, Pa., *pp.*
 228, 229
 RYERSON & SON, JOSEPH T., 16th & Rock-
 well Sts., Chicago, Ill., *p.* 366
 Thomas Spacing Machine Co., 1225 Fulton
 Bldg., Pittsburgh, Pa.
 TOLEDO MACHINE & TOOL CO., Toledo, O.,
p. 313
 Wickes Bros., Saginaw, Mich.
 WILLIAMS, WHITE & CO., Moline, Ill., *p.*
 314

PURIFIERS, FEED WATER

(See Heaters and Purifiers, Feed Water)

PYROMETERS**—Electric**

BRISTOL CO., Waterbury, Conn., *p.* 530
 BROWN INSTRUMENT CO., Philadelphia,
 Pa., *p.* 531
 ENGELHARD, CHARLES (Le Chatelier), 30
 Church St., New York... *p.* 532
 *FOXBORO CO., INC., Foxboro, Mass., *p.*
 533
 Frink Pyrometer Co., Lancaster, O.
 Gibb Instrument Co., 1644 Woodward Ave.,
 Detroit, Mich.
 HAYS CORP'N, JOS. W., Michigan City, Ind.,
p. 523
 Hoskins Mfg. Co., 467 Lantin Ave., Detroit,
 Mich.
 Leeds & Northrup Co., 4901 Stenton Ave., Phila-
 delphia, Pa.
 Locomotive Superheater Co., 30 Church St.,
 New York
 Price Electric Co., 12369 Euclid Ave., Cleveland,
 O.
 Queen-Gray Co., 616-620 Chestnut St., Phila-
 delphia, Pa.
 Scientific Materials Co., Pittsburgh, Pa.
 TAGLIABUE MFG. CO., C. J., 18-88 33rd St.,
 Brooklyn, N. Y., *p.* 535
 TAYLOR INSTRUMENT COS., Rochester,
 N. Y., *p.* 536
 Thwing Instrument Co., 3339 Lancaster Ave.,
 Philadelphia, Pa.
 *WESTINGHOUSE ELECTRIC & MFG. CO.,
 East Pittsburgh, Pa., *pp.* 114, 115
 Wilson-Macaulen Co., 781 E. 142nd St., New
 York

—Magnetic

Gibb Instrument Co., 1644 Woodward Ave.,
 Detroit, Mich.

—Optical

Gibb Instrument Co., 1644 Woodward Ave.,
 Detroit, Mich.
 Leeds & Northrup Co., 4901 Stenton Ave.,
 Philadelphia, Pa.
 Morse Thermo Gage Co., Ithaca, N. Y.
 Shore Instrument & Mfg. Co., 555 W. 22nd St.,
 New York
 TAYLOR INSTRUMENT COS., Rochester,
 N. Y., *p.* 536
 Thwing Instrument Co., 3339 Lancaster Ave.,
 Philadelphia, Pa.
 Zaubitz, A., 95-97 Cliff St., New York

—Pneumatic

UEHLING INSTRUMENT CO., 2011 Empire
 Bldg., New York... *p.* 525

—Radiation

BROWN INSTRUMENT CO., Philadelphia,
 Pa., *p.* 531
 TAYLOR INSTRUMENT COS., Rochester,
 N. Y., *p.* 536

**PYROMETRY, POTENTIOMETER SYSTEM
OF**

BROWN INSTRUMENT CO., Philadelphia,
 Pa., *p.* 531
 Leeds & Northrup Co., 4901 Stenton Ave., Phila-
 delphia, Pa.
 Pyroelectric Instrument Co., 148 E. State St.,
 Trenton, N. J.
PYROXYLIN APPARATUS
 BURROUGHS CO., CHARLES, Newark, N.
 J., *p.* 454

Q**QUARRYING MACHINERY**

FLORY MFG. CO., S., Bangor, Pa., *p.* 269
 *FULLER-LEHIGH CO., Fullerton, Pa., *p.*
 92
 INGERSOLL-RAND CO., 11 Broadway, New
 York... *pp.* 428, 429
 SULLIVAN MACHINERY CO., 121 S. Michi-
 gan Ave., Chicago, Ill., *p.* 430

R**RACKS****—Machine Cut**

*JAMES MFG. CO., D. O., 1118-24 W. Mon-
 roe St., Chicago, Ill., *pp.* 192, 193
 JONES FOUNDRY & MACHINE CO., W. A.,
 4401 W. 12th St., Chicago, Ill., *p.* 194
 VAN DORN & DUTTON CO., Cleveland, O.,
p. 370

—Tool

NEW BRITAIN MACHINE CO., New Britain,
 Conn., *p.* 336

RADIATOR TRAPS

(See Traps, Radiator)

RADIATORS, STEAM AND WATER

American Radiator Co., 816-822 S. Michigan
 Ave., Chicago, Ill.
 Gurney Heater Mfg. Co., 188-200 Franklin St.,
 Boston, Mass.
 Hudson Boiler Mfg. Co., 359 W. 42nd St., New
 York
 Kewanee Boiler Co., Kewanee, Ill.
 Minnesota Radiator Co., 59th Ave., W., Duluth,
 Minn.
 Modine Mfg. Co., Racine, Wis.
 Nason Mfg. Co., 71 Fulton St., New York
 *SMITH CO., H. B., Westfield, Mass., *p.* 478,
 479
 United States Radiator Corp'n, Detroit, Mich.

RAIL BOND TESTERS

*WESTON ELECTRICAL INSTRUMENT
 CO., 49 Weston Ave., Waverly Park, Newark,
 N. J., *p.* 537

RAIL JOINTS

(See Joints, Rail)

RAIL SAWS

ATKINS & CO., INC., E. C., Indianapolis,
 Ind., *p.* 385

—Portable

INDUSTRIAL WORKS, Bay City, Mich., *pp.*
 266, 267

Racine Tool & Machine Co., Racine, Wis.

RAILINGS, PIPE

*CRANE CO., 836 S. Michigan Ave., Chicago,
 Ill., *pp.* 120, 121, 122, 123
 Pancoast & Co., Henry B., 940-962 N. Front St.,
 Philadelphia, Pa.

RAILROAD TRACK SCALES

(See Scales, Railroad Track)

RAIL, STEEL

Bethlehem Steel Co., South Bethlehem, Pa.
 Lackawanna Steel Co., Buffalo, N. Y.

RAILWAYS**—Cable and Automatic**

*HUNT CO., INC., C. W., West New Brighton,
 Staten Island, N. Y., *pp.* 252, 253

Pun

ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p. 257*

—Industrial

Atlas Car & Mfg. Co., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.
***HUNT CO., INC.,** C. W., West New Brighton, Staten Island, N. Y... *pp. 252, 253*
***LINK-BELT CO.,** 39th St. & Stewart Ave., Chicago, Ill... *p. 256*
Steubner Iron Works, G. L., Hancock St. & Vernon Ave., Long Island City, N. Y.
Turl Iron & Car Co., Inc., 50 Broad St., New York
Weir Frog Co., Cincinnati, O.

RAMMERS, FOUNDRY

Cleveland Pneumatic Tool Co., 6410 Hawthorne Ave., Cleveland, O.
Dayton Molding Machine Co., Dayton, O.
INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*

RAMS, HYDRAULIC

Niagara Hydraulic Engine Co., Chester, Pa.
Rife Hydraulic Engine Mfg. Co., 90 West St., New York
***WORTHINGTON PUMP & MACHINERY CORP'N,** 115 Broadway, New York... *pp. 30, 117, 431, 447*

REAMERS

Advance Tool Co., Cincinnati, O.
Brubaker & Bros., W. L., 50 Church St., New York
Buckeye Twist Drill Co., Alliance, O.
Butterfield & Co., Derby Line, Vt.
CLEVELAND TWIST DRILL CO., Cleveland, O... *p. 378*
Conant & Donelson Co. (Reliable), Conway, Mass.
Davidson Tool Mfg. Corp'n, 120-124 Maiden Lane, New York
DEMING CO., Salem, O... *p. 440*
Detroit Reamer & Tool Co., 302 Congress St., East, Detroit, Mich.
Detroit Twist Drill Co., 634 Fort St., W., Detroit, Mich.
Gale-Sawyer Co., 33 Wormwood St., Boston, Mass.
***GREENFIELD TAP & DIE CORP'N,** Greenfield, Mass... *pp. 374, 375*
Lincoln Twist Drill Co., Taunton, Mass.
MCCROSKY REAMER CO., Meadville, Pa... *pp. 380, 381*
Mergenthaler Co., Baltimore, Md.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Brush near Boulevard, Detroit, Mich.
Rich Tool Co., 513 Railway Exchange, Chicago, Ill.
Standard Tool Co., 6900 Central Ave., Cleveland, Ohio
VAN DORN ELECTRIC TOOL CO., Cleveland, O... *p. 370*
Whitman & Barnes Mfg. Co., Akron, O.

—Adjustable and Expansion

Alvord Reamer & Tool Co., Millersburg, Pa.
Chadwick & Trefethen, 32 Row St., Portsmouth, N. H.
CLEVELAND TWIST DRILL CO., Cleveland, O... *p. 378*
Clough, R. M., Meriden, Conn.
Gisholt Machine Co., Madison, Wis.
Kelly Reamer Co., 1555 Columbus Road, Cleveland, O.
McCarthy Drill & Tool Corp'n, 30 Church St., New York
MCCROSKY REAMER CO., Meadville, Pa... *pp. 380, 381*
NATIONAL TOOL CO., Cleveland, O... *p. 383*
PRATT & WHITNEY CO., 111 Broadway, New York... *p. 344*
Rogers Works, Inc., John M., Gloucester City, N. J.

Schellenbach-Hunt Tool Co., 120 Opera Place, Cincinnati, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

RECEIVERS, AIR

***AMERICAN DISTRICT STEAM CO.,** North Tonawanda, N. Y... *p. 140*
Bury Compressor Co., Erie, Pa.
DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass... *pp. 44, 45*
FROST MFG. CO., 112 W. Adams St., Chicago, Ill... *pp. 47, 462*
INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 462*
KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p. 494*
MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis... *p. 112*
MORRISON BROS., Dubuque, Ia... *p. 495*
NORWALK IRON WORKS CO., So. Norwalk, Conn... *p. 427*
PHOENIX IRON WORKS CO., Meadville, Pa... *p. 497*
Ruemmel-Dawley Mfg. Co., 3923 Chouteau Ave., St. Louis, Mo.
WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa... *pp. 432, 433*
WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J... *p. 116*
***WORTHINGTON PUMP & MACHINERY CORP'N,** 115 Broadway, New York... *pp. 30, 117, 431, 447*

RECORDING INSTRUMENTS

(See Instruments, Recording)

RECOVERY SYSTEMS (Solids from Fumes)
BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... *p. 470*
Clark Dust Collecting Co., Fisher Bldg., Chicago, Ill.
Northern Blower Co., Cleveland, Ohio
STERLING BLOWER CO., Hartford, Conn... *p. 436*

RECTIFIERS

***GENERAL ELECTRIC CO.,** Schenectady, N. Y... *pp. 20, 21, 521*

REELS, METAL

AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa... *p. 200*
Mossberg Co., Frank, Attleboro, Mass.

REFLECTORS, ELECTRIC LIGHT

BENJAMIN ELECTRIC MFG. CO., 122 S. Sangamon St., Chicago, Ill... *p. 504*
Hubbell, Inc., Harvey, Bridgeport, Conn.
Wheeler Reflector Co., Boston, Mass.

REFRACTORIES

Ashland Fire Brick Co., Ashland, Ky.
Crescent Refractories Co., Curwensville, Clearfield County, Pa.
Didier-March Co., P. O. Box 327, Perth Amboy, N. J.
***JOHNS-MANVILLE CO.,** H. W., 296 Madison Ave., New York... *p. 162*
JOINTLESS FIRE BRICK CO., 1879 Kingsbury St., Chicago, Ill... *p. 99*
NORTON CO., Worcester, Mass... *p. 391*

REFRIGERATING MACHINERY

Arctic Ice Machine Co., Canton, O.
Armstrong Machinery Co., 3201-3219 E. Riverside, Spokane, Wash.
AUTOMATIC REFRIGERATING CO., Hartford, Conn... *p. 477*
Baker Ice Machine Co., Omaha, Nebr.
Buffalo Refrigerating Machine Co., 126 Liberty St., New York
Brunswick Refrigerating Co., New Brunswick, N. J.
Carbondale Machine Co., Carbondale, Pa.
Castle Refrigerating Machine Co., Indianapolis, Ind.
Clothel Co., 61 Broadway, New York
***DE LA VERGNE MACHINE CO.,** 1123 E. 138th St., New York... *p. 28*
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., 2815-21 Montrose Ave., Chicago, Ill.

Ref

REFRIGERATING MACHINERY

(Continued)

Isbell Porter Co., 46 Bridge St., Newark, N. J.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*
 Mayer Ice Machine & Engineering Co., Morris St. & Hudson River, Jersey City, N. J.
 Niebling Co., F. W., Norwood, Cincinnati, O.
 Pennsylvania Engineering Co., 119-21 N. Howard St., Philadelphia, Pa.
 Phoenix Ice Machine Co., 2711 Church Ave., Cleveland, O.
 Portsmouth Engine Co., Portsmouth, O.
 Remington Machine Co., Wilmington, Del.
 Rockler, H. B., 41 Maiden Lane, New York
 Standard Construction Engrg. & Supply Co., 1762 N. 29th St., Philadelphia.
 Triumph Ice Machine Co., South St., Oakley, Cincinnati, O.
 United Iron Works, Oakland, Cal.
 United Iron Works Co., Kansas City, Mo.
 Utility Compressor Co., 355 Harper Ave., E., Detroit, Mich.
 Vesterdahl & Co., Karl, 90 West St., New York
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis... *p. 18*
 VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*
 Vogt Brothers Mfg. Co., 1402 W. Main St., Louisville, Ky.
 Vulcan Iron Works, 1840 Kearny St., San Francisco, Cal.
 Wegner Machine Co., Perry & Mississippi Sts., Buffalo, N. Y.
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. *pp. 114, 115*
 York Mfg. Co., York, Pa.
 —Automatic
 AUTOMATIC REFRIGERATING CO., Hartford, Conn... *p. 477*
 Hallam, F. W., 80 Stanhope St., Brooklyn, N. Y.
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*

REGULATORS

—Blower

Ziermore Valve Co., Media, Pa.

—Damper

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*
 Berry Engineering Co. (Berry), Chester, Pa.
 Bushnell & Co., John S., 146 Liberty St., New York
 COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass... *pp. 76, 77*
 D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass... *p. 144*
 Eastwood Wire Mfg. Co., Belleville, N. J.
 Engineer Co., 17 Battery Place, New York
 FORD CO., THOMAS P., 407 Broome St., New York... *p. 125*
 Foskett & Bishop Co. (Clark), New Haven, Conn.
 Hess & Barker, 236 S. 8th St., Philadelphia, Pa.
 KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*
 Kitts Mfg. Co., Oswego, N. Y.
 Kitts Steam Specialty Co., 60 E. 1st St., Oswego, N. Y.
 Locke Regulator Co., Salem, Mass.
 McDonough Automatic Regulator Co., 716 Grand River Ave., Detroit, Mich.
 Power Turbo-Blower Co., 347 Madison Ave., New York
 Robertson & Sons, Jas L. (Spencer), 78-80 Murray St., New York
 Ruggles Klingham Mfg. Co., 10 High St., Boston, Mass.
 Spencer Regulator Co., 5 and 7 Front St., Salem, Mass.
 Standard Regulator Co., 252 South St., Newark, N. J.
 Thompson & Co., Richard, 126 Liberty St., New York
 Walker & Sons, Thomas, 4617-4621 Tacony St., Frankford, Philadelphia, Pa.

Watts Regulator Co. (Lawrence), 250-252 Lowell St., Lawrence, Mass.
 WILLIAMS, INC., FRANKLIN, 41 Cortlandt St., New York... *p. 161*

—Electric

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*
 Industrial Controller Co., Milwaukee, Wis.
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... *pp. 114, 115*

—Feed Water

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*
 Berry Engineering Co. (Berry), Chester, Pa.
 Boston Steam Specialty Co., 185 Franklin St., Boston, Mass.
 Burrows Mfg. Co., 41-43 N. Water St., York, Pa.
 Cade Co., H. E., 104 S. 4th St., Philadelphia, Pa.
 Central Machine Co., 7th, Wood & Franklin Sts., Philadelphia, Pa.
 Chaplin-Fulton Mfg. Co., 28 Penn Ave., Pittsburgh, Pa.
 KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*
 Kitts Mfg. Co., Oswego, N. Y.
 Kitts Steam Specialty Co., 60 E. 1st St., Oswego, N. Y.
 Northern Equipment Co., Erie, Pa.
 Plouff Co., 1500 River St., Boston, Mass.
 Ray Mfg. Co., 3247 Park Ave., Indianapolis, Ind.
 "S-C" REGULATOR MFG. CO., Fostoria, O... *p. 72*
 Sorge, Jr., & Co., A., Monadnock Block, Chicago, Ill.
 Steam Equipment Mfg. Co., 8077 Jenkins Arcade Bldg., Pittsburgh, Pa.
 TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... *p. 535*
 Williams Gauge Co., 543 Fourth Ave., Pittsburgh, Pa.
 —Pressure
 Altas Valve Co., Inc., 90 West St., New York
 *AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*
 BROWN INSTRUMENT CO., Philadelphia, Pa... *p. 531*
 Chaplin-Fulton Mfg. Co., 28 Penn Ave., Pittsburgh, Pa.
 Chicago Automatic Switch Co., 212 N. Peoria St., Chicago, Ill.
 Connelly Iron Sponge & Governor Co., 227 Fulton St., New York
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*
 FORD CO., THOMAS P., 407 Broome St., New York... *p. 125*
 Foster Engineering Co., Newark, N. J.
 *FOXBORO CO., INC., Foxboro, Mass... *p. 533*
 Hornung, J. C., 343 S. Dearborn St., Chicago, Ill.
 IDEAL AUTOMATIC GOVERNOR CO., 164 Ermet St., Newark, N. J... *p. 145*
 KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*
 Klippel Mfg. Co., 2651 W. Harris St., Chicago, Ill.
 LESLIE CO., Lyndhurst, N. J... *p. 147*
 Mason Regulator Co., Boston, Mass.
 Messer & Co., 121 N. 7th St., Philadelphia, Pa.
 Monash-Younger Co., 1407 W. Jackson Blvd., Chicago, Ill.
 Mueller Mfg. Co., H., Decatur, Ill.
 National Regulator Co., 145 E. 34th St., New York
 Ross Valve Mfg. Co., Troy, N. Y.
 TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... *p. 535*
 TAYLOR INSTRUMENT COS., Rochester, N. Y... *p. 536*
 Watson & McDaniel Co., 142 N. 7th St., Philadelphia, Pa.
 Watts Regulator Co., 250-252 Lowell St., Lawrence, Mass.

Ref

WILLIAMS, INC., FRANKLIN, 41 Cortlandt St., New York. *p. 101*
Ziermore Valve Co., Media, Pa.

—**Pump**

(See Governors, Pumps)

—**Temperature**

American Thermostat Co., 101 Mechanic St., Newark, N. J.
Bishop & Babcock Co., E. 49th & Hamilton Ave., Cleveland, Ohio

BRISTOL CO., Waterbury, Conn. *p. 530*

BROWN INSTRUMENT CO., Philadelphia, Pa. *p. 531*

Cramer, Stuart W., Charlotte, N. C.

***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill. *pp. 120, 121, 122, 123*

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass. *p. 144*

Equitherm Control Corp'n, 30 Church St., New York

***FOXBORO CO., INC.**, Foxboro, Mass. *p. 533*

Grandon Mfg. Co., Fore & Cross Sts., Portland, Me.

Hornung, J. C., 343 S. Dearborn St., Chicago, Ill.

Jewell Mfg. Co., 27 Clark St., Auburn, N. Y.

Johnson Service Co., Milwaukee, Wis.

KIELEY & MUELLER, INC., 34 W. 13th St., New York. *p. 146*

National Regulator Co., 145 E. 34th St., New York

Powers Regulator Co., 5 S. Wabash Ave., Chicago, Ill.

Roy's Heat Control Co., 915 Gates Ave., Brooklyn, N. Y.

***SARCO CO., INC.**, Woolworth Bldg., New York. *pp. 148, 149*

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y. *p. 535*

TAYLOR INSTRUMENT COS., Rochester, N. Y. *p. 636*

Weld Co., Geo. A., 79 Milk St., Boston, Mass.

—**Water Level**

FORD CO., THOMAS P., 407 Broome St., New York. *p. 125*

***FOXBORO CO., INC.**, Foxboro, Mass. *p. 533*

IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J. *p. 145*

KIELEY & MUELLER, INC., 34 W. 13th St., New York. *p. 146*

McDonough Automatic Regulator Co., 716 Grand River Ave., Detroit, Mich.

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y. *p. 535*

—**REPAIR WORK**

—**Boiler**

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill. *p. 56*

—**Elevator**

American Electric Machine & Elevator Co., 1706 N. 12th St., St. Louis, Mo.

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass. *p. 144*

Roberts Elevator Co., James H., 430 W. Broadway, New York.

—**Engine**

Hartford Engine Works, 223 State St., Hartford, Conn.

Watertown Engine & Machine Co., Watertown, N. Y.

Wendland Engineering & Construction Co., C. F., 63 Wooster St., New York

—**General Machine**

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind. *p. 35*

Central Machine Co., 7th, Wood & Franklin Sts., Philadelphia, Pa.

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass. *p. 144*

TORRINGTON MFG. CO., Torrington, Conn. *p. 483*

Tranter Mfg. Co., 105 Water St., Pittsburgh, Pa.

—**Marine**

Valk & Murdoch Co., Charleston, S. C.

—**Welding and Cutting**

OXWELD ACETYLENE CO., 646-656 Frelinghuysen Ave., Newark, N. J. *p. 421*

—**RESAWS**

—**Band**

ATKINS & CO., INC., E. C., Indianapolis, Ind. *p. 385*

Clark Bros. Co., Olean, N. Y.

—**Slab (Horizontal)**

Mereen-Johnson Machine Co., Minneapolis, Minn.

—**Vertical**

Mereen-Johnson Machine Co., Minneapolis, Minn.

—**RESERVOIRS, AERATING**

***SPRAY ENGINEERING CO.**, 93 Federal St., Boston, Mass. *p. 113*

—**RESTS, SLIDE**

AMERICAN TOOL & MACHINE CO., Boston, Mass. *p. 490*

—**RETAINERS, BALL**

BOSSERT CORP'N, Utica, N. Y. *p. 304*

Nice Ball Bearing Co., Land Title Bldg., Philadelphia, Pa.

Suspension Bearing Co., Spartanburg, S. C.

—**RETORTS, COAL GAS**

Didier-March Co., P. O. Box 327, Perth Amboy, N. J.

—**REVERSING, GEAR (Power—Locomotive)**

Economy Devices Corp'n, 30 Church St., New York

—**REVOLUTION RECORDERS**

BROWN INSTRUMENT CO., Philadelphia, Pa. *p. 531*

***FOXBORO CO., INC.**, Foxboro, Mass. *p. 533*

—**RICE MILLING MACHINERY**

Squier Mfg. Co., Geo. L., Buffalo, N. Y.

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill. *pp. 466, 467*

—**RIDDLES AND SIEVES**

Buffalo Wire Works Co., Buffalo, N. Y.

WRIGHT WIRE CO., Worcester, Mass. *p. 282*

—**RIFLING MACHINES**

PRATT & WHITNEY CO., 111 Broadway, New York. *p. 344*

SLOAN & CHACE MFG. CO., LTD., Sixth Ave., Cor. N. 13th St., Newark, N. J. *p. 357*

—**RINGS (Weldless)**

Crucible Steel Forge Co., 6607 Grant Ave., Cleveland, O.

Edgewater Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.

Hay-Budden Mfg. Co., 254 N. Henry St., Brooklyn, N. Y.

Ohio Forge Co., Cleveland, O.

PENNSYLVANIA FORGE CO., Bridesburg, Philadelphia, Pa. *p. 158*

Steel Forgings Co., Bootherton Road, Cincinnati, O.

VULCAN STEAM FORGING CO., 247 Rano St., Buffalo, N. Y. *p. 303*

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y. *p. 397*

—**RIVET AND BOLT HEADING MACHINES**

Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, O.

—**RIVET SETS**

INGERSOLL-RAND CO., 11 Broadway, New York. *pp. 428, 429*

Rich Tool Co., 513 Railway Exchange, Chicago, Ill.

Richards Co., I. P., 23 Pemberton St., Providence, R. I.

—**RIVET SPINNING MACHINES**

Grant Mfg. & Machine Co. (Grant), 90 Silliman Ave., Bridgeport, Conn.

Riv

RIVETERS**—Hydraulic**

ALLIANCE MACHINE CO., Alliance, O...*p.*
264

Chambersburg Engineering Co., Chambersburg,
Pa.

SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa...*p.*
456

WATSON-STILLMAN CO., 35 Church St., New
York...*p.* 457

Wood, William H., Media, Pa.
WOOD & CO., R. D., Philadelphia, Pa...*p.*
458

—Pneumatic

Allen Co., John F., 372 Gerard Ave., New York
Dayton Pneumatic Tool Co., Dayton, O.

Grant Mfg. & Machine Co. (Grant), 90 Silliman
Ave., Bridgeport, Conn.

INGERSOLL-RAND CO., 11 Broadway, New
York...*pp.* 428, 429

Oldham & Son Co., George, 4316-22 Tackawanna
St., Frankford, Philadelphia, Pa.

Whitney Metal Tool Co., 110 Forbes St., Rock-
ford, Ill.

—Vibrating

Grant Mfg. & Machine Co. (Grant), 90 Silliman
Ave., Bridgeport, Conn.

RIVETING MACHINES

Acme Machinery Co., Cleveland, O.

*BILTON MACHINE TOOL CO., Bridgeport,
Conn...*p.* 353

LONG & ALLSTATTER CO., Hamilton, O...
p. 309

Shuster Co., F. B., New Haven, Conn.

Smith Mfg. Co., F. H., 3037-3047 Carroll Ave.,
Chicago, Ill.

Townsend Mfg. Co., H. P., Hartford, Conn.

—Electric

Eveland Electric Riveter Co., West End Trust
Bldg., Philadelphia, Pa.

Roll High Speed Hammer Co., St. Paul St. & Ave. E,
Rochester, N. Y.

RIVETS

AMERICAN SCREW CO., Providence, R. I...
pp. 400, 401

COLUMBUS BOLT WORKS CO., Columbus,
O...*p.* 405

DILLON STEAM BOILER WORKS, D. M.,
Fitchburg, Mass...*pp.* 44, 45

Garland Nut & Rivet Co., West Pittsburgh,
Lawrence Co., Pa.

Lamson & Sessions Co., Cleveland, O.

Pittsburgh Screw & Bolt Co., Preble Ave., Pitts-
burgh, Pa.

Progressive Mfg. Co., Torrington, Conn.

Reed & Prince Mfg. Co., Duncan Ave., Worces-
ter, Mass.

RUSSELL, BURDSALL & WARD BOLT &
NUT CO., Port Chester, N. Y...*p.* 407

—Aluminum

ALUMINUM CO. OF AMERICA, Pittsburgh,
Pa...*p.* 294

—Boiler and Tank

CHAMPION RIVET CO., Cleveland, O...*p.*
408

Falls Rivet Co., Kent, O.

Upson Nut Co., Scranton Rd., Cleveland, O.

—Ship

CHAMPION RIVET CO., Cleveland, O...*p.*
408

—Structural Steel

Bayonne Bolt & Nut Co., Bayonne, N. J.

CHAMPION RIVET CO., Cleveland, O...*p.*
408

Oliver Iron & Steel Co., Pittsburgh, Pa.

—Wrought

RUSSELL, BURDSALL & WARD BOLT &
NUT CO., Port Chester, N. Y...*p.* 407

ROAD MAKING MACHINERY

Barber Asphalt Paving Co., Land Title Bldg.,
Philadelphia, Pa.

Connery & Co., Inc., 2nd & Luzerne Sts., Phila-
delphia, Pa.

Good Roads Machinery Co., Fort Wayne, Ind.

INGERSOLL-RAND CO., 11 Broadway, New
York...*pp.* 428, 429

Universal Road Machinery Co., Kingston, N. Y.

ROD POINTING MACHINES

FARNHAM MFG. CO., 31-39 Indiana St.,
Buffalo, N. Y...*p.* 277

Torrington Co., Torrington, Conn.

RODS**—Aluminum**

ALUMINUM CO. OF AMERICA, Pittsburgh,
Pa...*p.* 294

—Brass

Bristol Brass Co., Bristol, Conn.

Chase Rolling Mill Co., Waterbury, Conn.

Scovill Mfg. Co., Waterbury, Conn.

—Conduit

DIAMOND EXPANSION BOLT CO., 90 West
St., Cor. Cedar, New York...*p.* 409

—Drill

Lancaster Steel Products Co., Lancaster, Pa.

Pittsburgh Tool Steel Wire Co., Monaca, Pa.

WHEELLOCK, LOVEJOY & CO., 23 Cliff St.,
New York...*p.* 301

—Fibre

AMERICAN VULCANIZED FIBRE CO.,
Wilmington, Del...*p.* 296

*CONTINENTAL FIBRE CO., Newark, Del...
p. 297

*DIAMOND STATE FIBRE CO., Bridgeport,
Pa...*p.* 298

—Monel Metal

BAYONNE CASTING CO., Bayonne, N. J...*p.*
291

—Tie

Bayonne Bolt & Nut Co., Bayonne, N. J.

—Upset

Pittsburgh Screw & Bolt Co., Preble Ave., Pitts-
burgh, Pa.

—Welding

Gale Mfg. Co., Alvion, Mich.

ROLL GRINDING

*FULLER-LEHIGH CO., Fullerton, Pa...*p.*
92

ROLLER BEARINGS

(See Bearings, Roller)

ROLLERS (Cylindrical)

Ball & Roller Bearing Co., Danbury, Conn.

ROLLING MILL MACHINERY

Abramsen Engineering Co., Union Bank Bldg.,
Pittsburgh, Pa.

ALLIANCE MACHINE CO., Alliance, O...*p.*
264

Birdsboro Steel Foundry & Machine Co., Birds-
boro, Pa.

Birmingham Iron Foundry, Derby, Conn.

Buckeye Engine Co., Salem, O.

Carroll Foundry & Machine Co., Bucyrus, O.

Garrison Foundry Co., A., Pittsburgh, Pa.

Mackintosh, Hemphill & Co., 1227 Liberty Ave.,
Pittsburgh, Pa.

Mesta Machine Co., Box 1124, Pittsburgh, Pa.

Morgan Construction Co., Worcester, Mass.

Morgan Engineering Co., Alliance, O.

Newbold & Son Co., R. S., Norristown, Pa.

Philadelphia Roll & Machine Co., 23rd St. &
Washington Ave., Philadelphia, Pa.

PHOENIX IRON WORKS CO., Meadville, Pa.
p. 407

*POOLE ENGINEERING & MACHINE CO.
Woodberry, Baltimore, Md...*pp.* 196, 197

Reading Iron Co., Reading, Pa.

Richard Mfg. Co., Bloomsburg, Pa.

Standard Engineering Co., Ellwood City, Pa.

Standard Machinery Co., Auburn, R. I.

TORRINGTON MFG. CO., Torrington, Conn...
p. 483

Treadwell Eng. Co., 140 Cedar St., New York
Turner-Fricke Mfg. Co., Pittsburgh, Pa.
Wheeling Mold & Foundry Co., Farmers' Bank
Bldg., Pittsburgh, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Woodard Machine Co., Wooster, O.
Youngstown Foundry & Machine Co., Youngs-
town, O.

ROLLING PARTITIONS

(See Partitions, Rolling)

ROLLS**—Bending**

Badger State Machine Co., Janesville, Wis.
Covington Machine Co., Covington, Va.
Hendley & Whittemore Co., Beloit, Wis.
Hilles & Jones Co., Wilmington, Del.
Kling Bros. Engineering Works, 1302-1332 N.
Kostner Ave., Chicago, Ill.
New Doty Mfg. Co., Janesville, Wis.
NIAGARA MACHINE & TOOL WORKS,
Buffalo, N. Y., p. 312
NILES-BEMENT-POND CO., 111 Broadway,
New York, p. 344

Rock River Machine Co., Janesville, Wis.
SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa., p.
456

TOLEDO MACHINE & TOOL CO., Toledo,
O., p. 313

Wickes Bros., Saginaw, Mich.

—Calender (Paper, Cotton, Etc.)

Perkins & Son., B. F., Holyoke, Mass.
*POOLE ENGINEERING & MACHINE CO.,
Woodberry, Baltimore, Md., pp. 196, 197

—Crushing

BARTLETT & SNOW CO., C. O., Cleveland,
O., p. 249

Buchanan Co., C. G., Inc., 90 West St., New
York

BUCKEYE IRON & BRASS WORKS, Dayton,
O., p. 481

CHALMERS & WILLIAMS, 1450 Arnold St.,
Chicago Heights, Ill., p. 465

*LINK-BELT CO., 39th St. & Stewart Ave.,
Chicago, Ill., p. 256

Sturtevant Mill Co., Harrison Sq., Boston, Mass.

*WORTHINGTON PUMP & MACHINERY
CORP'N, 115 Broadway, New York, pp.
30, 117, 431, 447

—Forging

Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, O.
PENNSYLVANIA FORGE CO., Bridesburg,
Philadelphia, Pa., p. 158

—Rubber

GOODRICH RUBBER CO., B. F., Akron, O.,
pp. 183, 242

HOGGSON & PETTIS MFG. CO., New Haven,
Conn., pp. 394, 395, 396

*HUNT MACHINE CO., RODNEY, Orange,
Mass., p. 449

—Rubber Working

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

—Sand, Chilled and Steel

Birmingham Iron Foundry, Derby, Conn.

Garrison Foundry Co., A., Pittsburgh, Pa.

Loddell Car Wheel Co., Wilmington, Del.

Mackintosh, Hemphill & Co., 1227 Liberty Ave.,
Pittsburgh, Pa.

Philadelphia Roll & Machine Co., 23rd St. &
Washington Ave., Philadelphia, Pa.

Pittsburgh Iron & Steel Foundries Co. (Adamite),
314 Oliver Bldg., Pittsburgh, Pa.

Pittsburgh Roll Corp'n, Pittsburgh, Pa.

Standard Engineering Co., Ellwood City, Pa.

United Engineering & Foundry Co., Farmers'
Bank Bldg., Pittsburgh, Pa.

Wheeling Mold & Foundry Co., Farmers' Bank
Bldg., Pittsburgh, Pa.

Youngstown Foundry & Machine Co., Youngs-
town, O.

—Straightening

Hilles & Jones Co., Wilmington, Del.
Newbold & Son Co., R. S., Norristown, Pa.

NILES-BEMENT-POND CO., 111 Broadway,
New York, p. 344

SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa., p.
456

TOLEDO MACHINE & TOOL CO., Toledo,
O., p. 313

TORRINGTON MFG. CO., Torrington, Conn.,
p. 483

—Wood

*HUNT MACHINE CO., RODNEY, Orange,
Mass., p. 449

ROOFINGS**—Built-up**

Barrett Co., 17 Battery Place, New York

—Prepared

Barber Asphalt Paving Co., Land Title Bldg.,
Philadelphia, Pa.

Barrett Co., 17 Battery Place, New York

CAREY CO., PHILIP, Cincinnati, O., pp.
164, 165

Sall Mountain Co., 230 S. LaSalle St., Chicago,
Ill.

*THE TEXAS COMPANY, 17 Battery Place,
New York, p. 175

ROOFING AND SIDING

Aspromet Co., First National Bank Bldg., Pitts-
burgh, Pa.

Penn Metal Co., 201 Devonshire St., Boston,
Mass.

ROPE**—Cotton**

Lambeth Rope Corp'n, New Bedford, Mass.

—Hoisting

*HUNT CO., INC., C. W., West New Brighton,
Staten Island, N. Y., pp. 252, 253

MACOMBER & WHYTE ROPE CO., Kenosha,
Wis., p. 280

Plymouth Cordage Co., North Plymouth, Mass.

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J., p. 281

St. Louis Cordage Mills, St. Louis, Mo.
WRIGHT WIRE CO., Worcester, Mass., p. 282

—Manila

American Mfg. Co., Noble & West Sts., Brook-
lyn, N. Y.

Columbian Rope Co., Auburn, N. Y.

*FALLS CLUTCH & MACHINERY CO.,
Cuyahoga Falls, O., p. 207

*HUNT CO., INC., C. W., West New Brighton,
Staten Island, N. Y., p. 252, 253

MACOMBER & WHYTE ROPE CO., Kenosha,
Wis., p. 280

Plymouth Cordage Co., North Plymouth, Mass.

St. Louis Cordage Mills, St. Louis, Mo.

Wall Rope Works of New York, 48 South St.,
New York

Waterbury Co., 63 Park Row, New York

WELLER MFG. CO., 1820-1856 N. Kostner
Ave., Chicago, Ill., pp. 228, 259, 260

—Transmission

American Hoist & Derrick Co., St. Paul, Minn.

American Mfg. Co., Noble & West Sts., Brook-
lyn, N. Y.

*CALDWELL & SON CO., H. W., 175th St. &
Western Ave., Chicago, Ill., p. 250

Columbian Rope Co., Auburn, N. Y.

DODGE SALES & ENGINEERING CO.,
Mishawaka, Ind., pp. 202, 203, 204, 205, 206

Durable Wire Rope Co. (Jupiter), 95 Pearl St.,
Boston, Mass.

*HILL CLUTCH CO., Cleveland, O., p. 208

*HUNT CO., INC., C. W., West New Brighton,
Staten Island, N. Y., p. 252, 253

JONES FOUNDRY & MACHINE CO., W. A.,
4401 W. 12th St., Chicago, Ill., p. 194

Lambeth Rope Corp'n, New Bedford, Mass.

MACOMBER & WHYTE ROPE CO., Kenosha,
Wis., p. 280

Plymouth Cordage Co., North Plymouth, Mass.

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J., p. 281

Rop

ROPE (Continued)**—Transmission**

St. Louis Cordage Mills, St. Louis, Mo.
 Wall Rope Works of New York, 48 South St., New York
 Waterbury Co., 63 Park Row, New York
 WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill...*pp. 258, 259, 260*
 WRIGHT WIRE CO., Worcester, Mass...*p. 282*

—Wire

American Steel & Wire Co., 72 W. Adams St., Chicago, Ill.
 Broderick & Bascom Rope Co., St. Louis, Mo.
 Durable Wire Rope Co. (Durable), 95 Pearl St., Boston, Mass.
 Hazard Mfg. Co., Wilkes-Barre, Pa.
 Leschen & Sons Rope Co., A., St. Louis, Mo.
 MACOMBER & WHYTE ROPE CO., Kenosha, Wis...*p. 280*
 Moon Co., Inc., George C., Garwood, N. J.
 *ROEBLING'S SONS CO., JOHN A., Trenton, N. J...*p. 281*
 Rogers Wire Works, Inc., 291 Broadway, New York
 Waterbury Co., 63 Park Row, New York
 Williamsport Wire Rope Co., Williamsport, Pa.
 WRIGHT WIRE CO., Worcester, Mass...*p. 282*

ROPE DRESSING

ALBANY LUBRICATING COMPANY, 708-10 Washington St., New York...*p. 173*
 Cling-Surface Co., 1048 Niagara St., Buffalo, N. Y.
 DODGE SALES & ENGINEERING CO., Mishawaka, Ind...*pp. 202, 203, 204, 205, 206*
 Durable Wire Rope Co., 95 Pearl St., Boston, Mass.
 Ironsides Co., Columbus, O.

*THE TEXAS COMPANY, 17 Battery Place, New York...*p. 175*
 *WOOD'S SONS CO., T. B., Chambersburg, Pa...*pp. 212, 213*

ROPE DRIVES

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind...*p. 35*
 *BROWN CO., A. & F., 79 Barclay St., New York...*p. 187*
 *CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill...*p. 250*
 *CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn...*p. 268*
 DODGE SALES & ENGINEERING CO., Mishawaka, Ind...*pp. 202, 203, 204, 205, 206*
 *FALLS CLUTCH & MACHINERY CO., Cuyahoga Falls, O...*p. 207*
 *HILL CLUTCH CO., Cleveland, O...*p. 208*
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill...*p. 256*
 Medart Patent Pulley Co., St. Louis, Mo.
 *WOOD'S SONS CO., T. B., Chambersburg, Pa...*pp. 212, 213*

ROPE MAKING MACHINERY

Haskell-Dawes Machine Co., Erie & Trenton Aves., Philadelphia, Pa.

ROUTING MACHINES

Royle & Sons, John, Paterson, N. J.

RUBBER GOODS**—Hard**

American Hard Rubber Co., 11 Mercer St., New York
 GOODRICH RUBBER CO., B. F., Akron, O...*pp. 183, 242*
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York...*p. 162*
 Stokes Rubber Co., Jos., Trenton, N. J.

—Mechanical

Anchor Packing Co., 7th & Filbert Sts., Philadelphia, Pa.
 Boston Woven Hose & Rubber Co., Cambridge, Mass.

Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.

Cancos Mfg. Co., Bridge & Garden Sts., Bridenburgh, Philadelphia, Pa.
 Cincinnati Rubber Mfg. Co., Cincinnati, Ohio
 Consolidated Rubber Co., Trenton, N. J.
 Consumers Rubber Co., 829 Superior Ave., Cleveland, O.

Continental Rubber Works, Erie, Pa.
 "Double Service" Packing Co., 246 Chestnut St., Philadelphia, Pa.

GOODRICH RUBBER CO., B. F., Akron, O...*pp. 183, 242*

Goshen Rubber & Mfg. Co., Goshen, Ind.
 Gutta Percha & Rubber Mfg. Co., 126-128 Duane St., New York

Hamilton Rubber Mfg. Co., Trenton, N. J.
 *JENKINS BROS., 80 White St., New York...*pp. 128, 129*

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York...*p. 162*

Knowlton Rubber Co., G. W., 60 Pearl St., Boston, Mass.

NEW YORK RUBBER CO., 34 Reade St., New York...*pp. 244, 245*

Pennsylvania Rubber Co., Jeannette, Pa.
 Quabang Rubber Co., North Brookfield, Mass.
 Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.

Thermold Rubber Co., Trenton, N. J.
 United States Rubber Co., 1790 Broadway, New York

RUBBER MILL MACHINERY

American Process Co., 68 William St., New York
 Birmingham Iron Foundry, Derby, Conn.
 Cutter, Geo. A., Taunton, Mass.
 Day Co., J. H., 1144 Harrison Ave., Cincinnati, O.
 Farrel Foundry & Machine Co., Ansonia, Conn.
 STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill...*pp. 466, 467*

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

RUBBER TUBING MACHINES

Royle & Sons, John, Paterson, N. J.

RUST-PROOFING

Fickling Enameling Corp'n, Second at Webster Aves., Long Island City, N. Y.
 Parker Rust Proof Co. of America, Detroit, Mich.

S**SACCHAROMETERS**

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y...*p. 535*

SADDLES, PRESSED STEEL (Boiler)

DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass...*pp. 44, 45*
 GLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa...*p. 68*
 LUKENS STEEL CO., Coatesville, Pa...*p. 69*

SAFETY DEVICES

—Abrasive Wheel
 WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O...*p. 365*

—Elevator

Maintenance Co., 417-421 Canal St., New York

—Punching Press

Geuder, Paeschke & Frey Co., 1351 St. Paul Ave., Milwaukee, Wis.

SALT MAKING MACHINERY

WILLCOX ENGINEERING CO., Saginaw, Mich...*p. 516*

SAMPLING MACHINERY

Sturtevant Mill Co., Harrison Sq., Boston, Mass.

SAND BLAST APPARATUS

American Foundry Equipment Co., 52 Vanderbilt Ave., New York
 Brown Specialty Machinery Co., 2424 W. 22nd St., Chicago, Ill.
 Factory Engineering Co., 780 Hippodrome Prospect Ave., Cleveland, O.

Hoel Mfg. Corp'n, 50 Church St., New York
 MacLeod Co., Bogen St., Cincinnati, Ohio
 Mott Sand Blast Mfg. Co., Inc., 2-8 Frost St.,
 Brooklyn, N. Y.

NEW HAVEN SAND BLAST CO., New Haven,
 Conn... p. 459

*PANGBORN CORP'N, P. O. Box 859, Hagers-
 town, Md... p. 460, 461

Sly Mfg. Co., W. W., Cleveland, O.
 STERLING BLOWER CO., Hartford, Conn...
 p. 436

Tighman-Brooksbank Sand Blast Co., 1126 S.
 Eleventh St., Philadelphia, Pa.

SAND BLAST CABINETS

*PANGBORN CORP'N, P. O. Box 859, Hagers-
 town, Md... pp. 460, 461

SAND BLAST ROOMS

American Foundry & Equipment Co., 52 Vander-
 bilt Ave., New York

Hoel Mfg. Corp'n, 50 Church St., New York
 Mott Sand Blast Mfg. Co., Inc., 2-8 Frost St.,
 Brooklyn, N. Y.

*PANGBORN CORP'N, P. O. Box 859, Hagers-
 town, Md... pp. 460, 461

STERLING BLOWER CO., Hartford, Conn...
 p. 436

Tighman-Brooksbank Sand Blast Co., 1126 S.
 Eleventh St., Philadelphia, Pa.

SAND CUTTING MACHINERY

Sand Mixing Machine Co., 52 Vanderbilt Ave.,
 New York

SAND MAKING MACHINERY

Phillips & McLaren, 24th & Smallman Sts.,
 Pittsburgh, Pa.

SANDERS, LOCOMOTIVE

UNITED STATES METALLIC PACKING
 CO., 221 N. 13th St., Philadelphia, Pa... p.
 181

SASH, STEEL

Bayley Co., William, Springfield, O.
 Detroit Steel Products Co., 2250 E. Grand
 Blvd., Detroit, Mich.

Lupton's Sons Co., David, Allegheny Ave.,
 Tulip St., Philadelphia, Pa.

Thorn Co., J. S., 20th St. & Allegheny Ave.,
 Philadelphia, Pa.

SASH OPERATING DEVICES

Bayley Co., William, Springfield, O.
 Detroit Steel Products Co., 2250 E. Grand
 Blvd., Detroit, Mich.

Drouve Co., G., Bridgeport, Conn.

Hitchings & Co., Elizabeth, N. J.

Lupton's Sons Co., David, Allegheny Ave. &
 Tulip St., Philadelphia, Pa.

SAW BLADES, HACK

ATKINS & CO., INC., E. C., Indianapolis, Ind...
 p. 385

Napier Saw Works, Inc., Springfield, Mass.

Racine Tool & Machine Co., Racine, Wis.

STERLING GRINDING WHEEL CO., Tiffin,
 O... p. 392

VICTOR SAW WORKS, Springfield, Mass... p.
 387

West Haven Mfg. Co., New Haven, Conn.

SAW FRAMES, HACK

ATKINS & CO., INC., E. C., Indianapolis, Ind...
 p. 385

Dissinger & Bro., Inc., C. H. A., Wrightsville, Pa.
 West Haven Mfg. Co., New Haven, Conn.

SAW MILL MACHINERY

*ALLIS-CHALMERS MFG. CO., Milwaukee,
 Wis... p. 15

Beach Mfg. Co., Montrose, Pa.

Breting Mfg. Co., C. G., Ashland, Wis.

Chase Turbine Mfg. Co., Orange, Mass.

Clark Bros. Co., Olean, N. Y.

Corinth Machinery Co., Corinth, Miss.

Enterprise Co., Columbiana, Ohio.

Fay & Eagan Co., J. A., Cincinnati, O.

Filer & Stowell Co., Milwaukee, Wis.

Garland Co., M., Bay City, Mich.

Lane Mfg. Co., Montpelier, Vt.

Liddell Co., Charlotte, N. C.

McDonough Mfg. Co., Eau Claire, Wis.

Phoenix Mfg. Co., Eau Claire, Wis.

Prescott Co., Menominee, Mich.

Sinker Davis Co., Indianapolis, Ind.

Soule Steam Feed Works, Meridan, Miss.

SAW RIGS (Portable)

NOVO ENGINE CO., Lansing, Mich... pp.
 444, 445

SAW SHARPENING MACHINES

ATKINS & CO., INC., E. C., Indianapolis, Ind...
 p. 385

Cochrane-Bly Co., Rochester, N. Y.

Espen-Lucas Machine Works, Front & Girard
 Ave., Philadelphia, Pa.

*GREENFIELD TAP & DIE CORP'N,
 Greenfield, Mass... pp. 374, 375

NILES-BEMENT-POND CO., 111 Broadway,
 New York... p. 344

Wardwell Mfg. Co., 110-112 Hamilton Ave.
 Cleveland, O.

—Circular

Wardwell Mfg. Co., 110-112 Hamilton Ave.,
 Cleveland, O.

SAWING MACHINES, CIRCULAR (Wood)

Greenlee Bros. & Co., Rockford, Ill.

SAWS

—Band

Armstrong-Blum Mfg. Co., 333-357 N. Francisco
 Ave., Chicago, Ill.

ATKINS & CO., INC., E. C., Indianapolis,
 Ind... p. 385

Disston & Sons, Inc., Henry, Philadelphia, Pa.

HUTHER BROS. SAW MFG. CO., Rochester,
 N. Y... p. 386

JONES FOUNDRY & MACHINE CO., W. A.,
 4401 W. 12th St., Chicago, Ill... p. 194

Napier Saw Works, Inc., Springfield, Mass.

Oliver Machinery Co., Grand Rapids, Mich.

Shinn & Co., M. E., 1846 W. Lake St., Chicago,
 Ill.

Sinker Davis Co., Indianapolis, Ind.

Thompson & Son Co., Henry G., New Haven,
 Conn.

—Circular (Metal)

ATKINS & CO., INC., E. C., Indianapolis, Ind...
 p. 385

Cochrane-Bly Co., Rochester, N. Y.

Disston & Sons, Inc., Henry, Philadelphia, Pa.

Dyett Co., Frank J., 73 John St., Iliou, N. Y.

Higley Machine Co., Croton Falls, N. Y.

Hunter Saw & Machine Co., 57th & Butler Sts.,
 Pittsburgh, Pa.

HUTHER BROS. SAW MFG. CO., Rochester,
 N. Y... p. 386

JONES FOUNDRY & MACHINE CO., W. A.,
 4401 W. 12th St., Chicago, Ill... p. 194

Napier Saw Works, Inc., Springfield, Mass.

NATIONAL TOOL CO., Cleveland, O... p.
 383

Peerless Machine Co., Racine, Wis.

Simonds Mfg. Co., Fitchburg, Mass.

TORRINGTON MFG. CO., Torrington, Conn...
 p. 483

—Circular (Metal, Inserted Tooth)

ATKINS & CO., INC., E. C., Indianapolis, Ind...
 p. 385

BECKER MILLING MACHINE CO., Hyde
 Park, Boston, Mass... p. 352

Hoe & Co., R., 504-520 Grand St., New York

Hunter Saw & Machine Co., 57th & Butler Sts.,
 Pittsburgh, Pa.

HUTHER BROS. SAW MFG. CO., Rochester,
 N. Y... p. 386

NILES-BEMENT-POND CO., 111 Broadway,
 New York... p. 344

Tabor Mfg. Co., 18th & Hamilton Sts, Phila-
 delphia, Pa.

—Grooving

ATKINS & CO., INC., E. C., Indianapolis, Ind...
 p. 385

Hendley & Whittemore Co., Beloit, Wis.

Saw

SAWS (Continued)**—Grooving**

HUTHER BROS. SAW MFG. CO., Rochester, N. Y. . . *p. 386*

—Hack (Power)

Armstrong-Blum Mfg. Co., 333-357 N. Francisco Ave., Chicago, Ill.

ATKINS & CO., INC., E. C., Indianapolis, Ind., *p. 385*

Myers Machine Tool Co., Second & Chestnut Sts., Columbia, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York. . . *p. 344*

Racine Tool & Machine Co., Racine, Wis.

Robertson Machine & Foundry Co., W., 56-58 Rano St., Buffalo, N. Y.

Thompson & Son Co., Henry G., New Haven, Conn.

West Haven Mfg. Co., New Haven, Conn.

Western Tool & Mfg. Co., Springfield, O.

—Hack (Power, Automatic)

Armstrong-Blum Mfg. Co., 333-357 N. Francisco Ave., Chicago, Ill.

ATKINS & CO., INC., E. C., Indianapolis, Ind. . . *p. 385*

Thompson & Son Co., Henry G., New Haven, Conn.

—High Speed Friction

RYERSON & SON, JOSEPH T., 16th & Rockwell Sts., Chicago, Ill. . . *p. 366*

—Hot Metal

Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, O.

—Rip

ATKINS & CO., INC., E. C., Indianapolis, Ind. . . *p. 385*

HUTHER BROS. SAW MFG. CO., Rochester, N. Y. . . *p. 386*

Woods Engineering Co., 108 Patterson St., Alliance, O.

Saw

—Swing (Electric)

Reno Kaetker Electric Co., Gerke Bldg., Cincinnati, O.

—Testing

FARNHAM MFG. CO., 31-39 Indiana St., Buffalo, N. Y. . . *p. 277*

SCALES

—Abattoir

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

—Automatic

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

Automatic Weighing Machine Co., 134-140 Commerce St., Newark, N. J.

Boston Scale & Machine Co., 100 Rugges St., Boston, Mass.

Computing Scale Co., Dayton, O.

CONVEYING WEICHER CO., 90 West St., New York. . . *p. 251*

Fairbanks & Co., E. & T., St. Johnsbury, Vt.

Howe Scale Co. of N. Y., 341 Broadway, New York

RICHARDSON SCALE CO., Passaic, N. J. . . *p. 514*

SIMMONS CO., JOHN, 110 Center St., New York. . . *p. 515*

Toledo Scale Co., Toledo, O.

—Charging Crane

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

—Conveyor

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

Electric Weighing Co., 182 Thirteenth Ave., New York

*LINK BELT CO., 39th St. & Stewart Ave., Chicago, Ill. . . *p. 256*

—Crane

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

—Dormant

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

Buffalo Scale Co., 15 Illinois St., Buffalo, N. Y.

Jones of Binghamton, Inc., Binghamton, N. Y.

Standard Scale & Supply Co., 1631 Liberty Ave., Pittsburgh, Pa.

Toledo Scale Co., Toledo, O.

—Fluid Pressure

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass. . . *p. 527*

—Hanging

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

—Hopper

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

RICHARDSON SCALE CO., Passaic, N. J. . . *p. 514*

—Industrial Railway

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

Fairbanks & Co., E. & T., St. Johnsbury, Vt.

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y. . . *pp. 252, 253*

Standard Scale & Supply Co., 1631 Liberty Ave., Pittsburgh, Pa.

—Larry Car

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

—Mine Tipple

Standard Scale & Supply Co., 1631 Liberty Ave., Pittsburgh, Pa.

Streeter-Amet Weighing & Recording Co., 4101-05 Ravenswood Ave., Chicago, Ill.

—Monorail

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

—Picker Lap

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

—Platform

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

Buffalo Scale Co., 15 Illinois St., Buffalo, N. Y.

Chatillon & Sons, John, 85-93 Cliff St., New York

Fairbanks Co., 416-422 Broome St., New York

Howe Scale Co. of N. Y., 341 Broadway, New York

Jones of Binghamton, Inc., Binghamton, N. Y.

Toledo Scale Co., Toledo, O.

—Railroad Track

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

Buffalo Scale Co., 15 Illinois St., Buffalo, N. Y.

Standard Scale & Supply Co., 1631 Liberty Ave., Pittsburgh, Pa.

Streeter-Amet Weighing & Recording Co., 4101-05 Ravenswood Ave., Chicago, Ill.

—Wagon

AMERICAN KRON SCALE CO., 430 E. 53rd St., New York. . . *p. 513*

Jones of Binghamton, Inc., Binghamton, N. Y.

SCLEROSCOPES (Hardness Tester)

Shore Instrument & Mfg. Co., 555 W. 22nd St., New York

SCRAP METAL BUNDLERS

(See Bundlers, Scrap Metal)

SCREENS

—Flume

*HUNT MACHINE CO., RODNEY, Orange, Mass. . . *p. 449*

WRIGHT WIRE CO., Worcester, Mass. . . *p. 282*

—Monel Metal Wire

Michigan Wire Cloth Co., 536 Howard St., Detroit, Mich.

—Perforated Metal

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill. . . *p. 250*

Erdle Perforating Co., 171 York St., Rochester, N. Y.
 Harrington & King Perforating Co., 629 N. Union Ave., Chicago, Ill.
 Manhattan Perforated Metal Co., 237 Centre St., New York
 Mundt & Sons, Charles, 53-65 Fairmount Ave., Jersey City, N. J.

—Revolving

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*
 *CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*
 *CHAIN BELT CO., 735 Park St., Milwaukee, Wis... *pp. 118, 119*
 CHALMERS & WILLIAMS, 1450 Arnold St., Chicago Heights, Ill... *p. 465*
 Good Roads Machinery Co., Fort Wayne, Ind.
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*
 McLanahan-Stone Machine Co., Hollidaysburg, Pa.
 ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p. 257*
 Stedman's Foundry & Machine Works, Aurora, Ind.
 Walker & Ellicott, Wilmington, Del.
 WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp. 258, 259, 260*
 WRIGHT WIRE CO., Worcester Mass... *p. 282*

—Shaking

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*
 Brown Specialty Machinery Co., 2424 W. 22nd St., Chicago, Ill.
 *CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*
 *CHAIN BELT CO., 735 Park St., Milwaukee, Wis... *pp. 118, 119*
 CHALMERS & WILLIAMS, 1450 Arnold St., Chicago Heights, Ill... *p. 465*
 Excavating & Screening Machinery Co., 743 Security Bldg., Minneapolis, Minn.
 Fairmont Mining Machinery Co., Fairmont, W. Va.
 HOLMES & BROS., ROBT., Danville, Ill... *p. 270*
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*
 ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p. 257*
 Schaffer Engineering & Equipment Co., Tiffin, O.
 Sturtevant Mill Co., Harrison Sq., Boston, Mass.
 *WILLIAMS PATENT CRUSHER & PULVERIZER CO., Old Colony Bldg., Chicago, Ill... *pp. 468, 469*
 WRIGHT WIRE CO., Worcester, Mass... *p. 282*

—Water Intake (Traveling)

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis... *pp. 118, 119*
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*

—Well

Cook, A. D., Lawrenceburg, Ind.
 MARK MFG. CO., P. O. Box G, Chicago, Ill... *p. 160*

—Wire

BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*
 Bolles Iron & Wire Works, J. E., 53 Porter St., Detroit, Mich.
 *CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*
 Michigan Wire Cloth Co., 536 Howard St., Detroit, Mich.
 Morse & Whyte Co., Cambridge, Mass.
 New Jersey Wire Cloth Co., Trenton, N. J.
 WRIGHT WIRE CO., Worcester, Mass... *p. 282*

SCREW CUTTING DIES

(See Dies, Thread Cutting)

SCREW DRIVING MACHINES

Reynolds Machine Co., N. West St., Massillon, O.
 —Electric (Portable)
 Neil & Smith Electric Tool Co., Cincinnati, O.

SCREW JACKS

(See Jacks, Screw)

SCREW MACHINE PRODUCTS

Albaugh-Dover Co., 2100 Marshall Blvd., Chicago, Ill.
 AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*
 Atlas Brass Foundry Co., 980 S. Park St., Columbus, O.
 BABSON-DOW MFG. CO., 60 Fulda St., Roxbury, Boston, Mass... *p. 399*
 Ball & Roller Bearing Co., Danbury, Conn.
 Barnes Co., Wallace, Main St., Bristol, Conn.
 Bell Co., 1555 Fillmore Ave., Buffalo, N. Y.
 Belvidere Screw & Machine Co., Belvidere, Ill.
 BLAKE & JOHNSON CO., Waterbury, Conn... *p. 482*
 Brown Bag Filling Machine Co., 20 Main St., Fitchburg, Mass.
 Chicago Automatic Machine Co., 400-408 N. Oakley Blvd., Chicago, Ill.
 Chicago Screw Co., 1026 S. Homan Ave., Chicago, Ill.
 CINCINNATI SCREW CO., Twightwee, O. (Cincinnati Suburb)... *p. 402*
 CORBIN SCREW CORP'N, New Britain, Conn... *p. 403*
 Dallett Co., Thomas H., Broad & Federal Sts., Philadelphia, Pa.
 Defiance Screw Machine Products Co., 731 Perry St., Defiance, O.
 Detroit Screw Works, Detroit, Mich.
 Eastern Machine Screw Corp'n, New Haven, Conn.
 Federal Bearings Co., Inc., 110 William St., Poughkeepsie, N. Y.
 Ferry Cap & Set Screw Co., 2151 Scranton Road, Cleveland, O.
 Fostoria Screw Co., Fostoria, O.
 Hanson Bros., Plainville, Conn.
 Hartford Machine Screw Co., Hartford, Conn.
 Hill Pump Valve Co., Archer Ave., Canal & 23rd Sts., Chicago, Ill.
 MEHL MACHINE TOOL & DIE CO., Roselle, N. J... *pp. 376, 377*
 Moore, Geo. W., 44 Farnsworth St., Boston, Mass.
 NATIONAL ACME CO., Cleveland, O... *pp. 334, 335*
 Nelson Mfg. Co., A., 564 W. Randolph St., Chicago, Ill.
 New Haven Screw Co., 191-193 Foster St., New Haven, Conn.
 Niagara Brass Mfg. Co., Inc., 163 Adams St., Buffalo, N. Y.
 Peninsular Milled Screw Co., 1090 Lafayette E., Detroit, Mich.
 Perry-Fay Co., Elyria, O.
 Phillips Mfg. Co., R. B., 3 Grand St., Court, Worcester, Mass.
 *PRECISION INSTRUMENT CO., Detroit, Mich... *p. 524*
 Ramsdell Specialty Co., W. Boylston St., Worcester, Mass.
 Sherman Klove Co., 4519 W. Harrison St., Chicago, Ill.
 SHIMER & SONS, SAMUEL J., Milton, Pa... *p. 404*
 St. Louis Screw Co., St. Louis, Mo.
 Smith Mfg. Co., F. H., 3037-3047 Carroll Ave., Chicago, Ill.
 Standard Screw Products Co., Bellevue & Warren Ave., Detroit, Mich.
 Tock Screw Machine Products Corp'n, 199 Eighth St., Long Island City, N. Y.
 U. S. Automatic Co., Amherst, O.
 Weiss, Louis T., 286 Taaffe Place, Brooklyn, N. Y.
 Western Automatic Machine Screw Co., Elyria, O.
 Winchester Repeating Arms Co., New Haven, Conn.

Screw

SCREW MACHINE PRODUCTS (Continued)
Worcester Machine Screw Co., Worcester, Mass.**SCREW MACHINES****—Automatic**

Brown & Sharpe Mfg. Co., Promenade St., Providence, R. I.

Chicago Automatic Machine Co., 406-408 N. Oakley Blvd., Chicago, Ill.

CLEVELAND AUTOMATIC MACHINE CO., Cleveland, O... *p. 333*

Fitchburg Automatic Machine Works, Fitchburg, Mass.

NATIONAL ACME CO., Cleveland, O... *pp. 334, 335***—Automatic, Multiple Spindle**

Cincinnati Automatic Machine Co., Cincinnati, O. Davenport Machine Tool Co., 34 N. 2nd St., New Bedford, Mass.

Fitchburg Automatic Machine Works, Fitchburg, Mass.

NATIONAL ACME CO., Cleveland, O... *pp. 334, 335*NEW BRITAIN MACHINE CO., New Britain, Conn... *p. 336***—Hand**ACME MACHINE TOOL CO., Cincinnati, O... *p. 319*

Bardons & Oliver, 1133 Ninth St., Cleveland, O. Brown & Sharpe Mfr. Co., Promenade St., Providence, R. I.

Drees Machine Tool Co., 227 W. McMicken Ave., Cincinnati, O.

Fitchburg Automatic Machine Works, Fitchburg, Mass.

Foster Machine Co., Elkhart, Ind.

Garvin Machine Co., Spring & Varick Sts., New York

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass... *pp. 374, 375*HIMOFF MACHINE CO., 45-53 Mills St., Astoria, New York... *p. 350*LYND-FARQUHAR CO., Boston, Mass... *p. 348*

Millholland Machine Co., W. K., Indianapolis, Ind.

Perry-Fay Co., Elyria, O.

Pierce Machine Tool Co., 617 W. Jackson Blvd., Chicago, Ill.

Smurr & Kamen Co., 328 N. Albany Ave., Chicago, Ill.

Southworth Machine Co., Portland, Me.

*WARNER & SWASEY CO., Cleveland, O... *pp. 328, 329*

Wicac Screw & Machine Works, Inc., N. E. Cor. 7th & Wood Sts., Philadelphia, Pa.

—Semi-Automatic

Smurr & Kamen Co., 328 N. Albany Ave., Chicago, Ill.

WOOD TURRET MACHINE CO. (Tilted Turret), Brazil, Ind... *pp. 330, 331***SCREW PLATES**

American Tap & Die Co. (Acme), Greenfield, Mass.

Butterfield & Co., Derby Line, Vt.

Card Mfg. Co., S. W., Rumford Ave., Mansfield, Mass.

Conant & Donelson Co. (Reliable), Conway, Mass.

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass... *pp. 374, 375*

Winter Bros. Co., Wrentham, Mass.

SCREW STEEL

Blum & Co., Julius, 510-512 W. 24th St., New York

Brightman Mfg. Co., So. Columbus, O.

—Cold Drawn

Columbia Steel & Shafting Co., Pittsburgh, Pa.

Standard Screw Products Co., Bellevue & Warren Ave., Detroit, Mich.

*UNION DRAWN STEEL CO., Beaver Falls, Pa... *p. 300*WHEELOCK, LOVEJOY & CO., 23 Cliff St., New York... *p. 301***SCREW THREAD ROLLING MACHINES**BLAKE & JOHNSON CO., Waterbury, Conn... *p. 482***—Sheet Metal**BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *p. 310, 311***SCREWS****—Cap and Set**BABSON-DOW MFG. CO., 60 Fulda St., Roxbury, Boston, Mass... *p. 399*

Chicago Screw Co., 1026 S. Homan Ave., Chicago, Ill.

CINCINNATI SCREW CO., Twightwee, O. (Cincinnati Suburb)... *p. 402*

Clark Bros. Bolt Co., Milldale, Conn.

Cleveland Wrought Products Co., Cleveland, O.

CORBIN SCREW CORP'N, New Britain, Conn... *p. 403*

Detroit Screw Works, Detroit, Mich.

Ferry Cap & Set Screw Co., 2151 Scranton Road, Cleveland, O.

Fostoria Screw Co., Fostoria, O.

Metals Welding Co., 4400 Perkins Ave., Cleveland, O.

New Haven Screw Co., 191-193 Foster St., New Haven, Conn.

Niagara Screw Co., 20 Lock St., Buffalo, N. Y.

Phillips Mfg. Co., R. B., 3 Grand St., Court, Worcester, Mass.

Rhode Island Tool Co., 148 West River St., Providence, R. I.

Sherman Kolve Co., 4519 W. Harrison St., Chicago, Ill.

SHIMER & SONS, SAMUEL J., Milton, Pa... *p. 404*

St. Louis Screw Co., St. Louis, Mo.

Standard Screw Products Co., Bellevue & Warren Ave., Detroit, Mich.

U. S. Automatic Co., Amherst, O.

Western Automatic Machine Screw Co., Elyria, O.

Worcester Machine Screw Co., Worcester, Mass.

—MachineAMERICAN SCREW CO., Providence, R. I... *pp. 400, 401*

Bell Co., 1555 Fillmore Ave., Buffalo, N. Y.

BLAKE & JOHNSON CO., Waterbury, Conn... *p. 482*CINCINNATI SCREW CO., Twightwee, O. (Cincinnati Suburb)... *p. 402*CORBIN SCREW CORP'N, New Britain, Conn... *p. 403*

Detroit Screw Works, Detroit, Mich.

Hubbell, Inc., Harvey, Bridgeport, Conn.

Keystone Screw Co., 17th St. & Lehigh Ave., Philadelphia, Pa.

Moore, Geo. W., 44 Farnsworth St., Boston, Mass.

Phillips Mfg. Co., R. B., 3 Grand St., Court, Worcester, Mass.

Progressive Mfg. Co., Torrington, Conn.

Reed & Prince Mfg. Co., Duncan Ave., Worcester, Mass.

Wicac Screw & Machine Works, Inc., N. E. Cor. 7th & Wood Sts., Philadelphia, Pa.

Worcester Machine Screw Co., Worcester, Mass.

—Safety Set

Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.

BRISTOL CO., Waterbury, Conn... *p. 530*

Flower & Co., Walter L., 312-314 S. 8th St., St. Louis, Mo.

New Haven Screw Co., 191-193 Foster St., New Haven, Conn.

Standard Pressed Steel Co., 20th & Clearfield Sts., Philadelphia, Pa.

—Socket Head

Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.

—ThumbWILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... *p. 397***—Wood**AMERICAN SCREW CO., Providence, R. I... *pp. 400, 401*

Bridgeport Screw Co., Bridgeport, Conn.

Screw

CORBIN SCREW CORP'N, New Britain, Conn... *p. 403*
Reading Screw Co., Norristown, Pa.
Reed & Prince Mfg. Co., Duncan Ave., Worcester, Mass.

SEALING MACHINES

(See Carton Sealing Machines)

SEPARATORS**—Ammonia**

*DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York... *p. 28*
VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*

—Gasoline

Bousman Mfg. Co., 1153-57 Plainfield Ave., N. E., Grand Rapids, Mich.

—Magnetic

Buchanan Co., C. G., Inc., 90 West St., New York
Dienelt & Eisenhardt, Inc., 1304 N. Howard St., Philadelphia, Pa.

—Metal Chip

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 490*
DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*
National Separator & Machine Co., 89 State St., Boston, Mass.

OIL & WASTE SAVING MACHINE CO., 1509 Real Estate Trust Bldg., Philadelphia, Pa... *p. 419*

—Oil

Albany Steam Trap Co., 317 N. Pearl St., Albany, N. Y.
Anderson Co., V. D., W. 96th St., Cleveland, O.
Andrews, Inc., William, 120 Liberty St., New York

Baragwanath & Son, Wm., 1633 Monadnock Block, Chicago, Ill.
Boston Steam Specialty Co., 185 Franklin St., Boston, Mass.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

DE LAVAL STEAM TURBINE CO., Trenton, N. J... *p. 22*

Direct Separator Co., Syracuse, N. Y.
HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*

Kelley & Son., Benj. F., 25 Church St., New York

KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*

KRAUSE, A. E., Mountain Lakes, N. J... *p. 111*

Linton Machine Co., 26 Cortlandt St., New York

*NATIONAL PIPE BENDING CO., New Haven, Conn... *pp. 106, 107*

National Separator & Machine Co., 89 State St., Boston, Mass.

OIL & WASTE SAVING MACHINE CO., 1509 Real Estate Trust Bldg., Philadelphia, Pa... *p. 419*

Open Coil Heater & Purifier Co., Indianapolis, Ind.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

Power Plant Specialty Co., 1306 Monadnock Bldg., Chicago, Ill.

Standard Steam Specialty Co. (Utility), 542 West Broadway, New York

WEBSTER & CO. WARREN, Camden, N. J... *pp. 108, 109, 110*

—Steam

Anderson Co., V. D., W. 96th St., Cleveland, O.
Colles Heater & Specialty Co., 14 E. Jackson Blvd., Chicago, Ill.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass... *p. 144*

Direct Separator Co., Syracuse, N. Y.

HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*

Hoppes Mfg. Co., 19 Larch St., Springfield, O.
Illinois Engineering Co., Racine at 21st St., Chicago, Ill.

Jacobs & Co., Charles (Lowden), 258 Franklin St., Boston, Mass.

KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*

Liberty Mfg. Co., 6900 Susquehanna St., Pittsburgh, Pa.

*NATIONAL PIPE BENDING CO., New Haven, Conn... *pp. 106, 107*

Nicholson & Co., W. H., Wilkes-Barre, Pa.

Nightingale & Childs Co., 205 Congress St., Boston, Mass.

Ohio Blower Co., Cleveland, O.
Open Coil Heater & Purifier Co., Indianapolis, Ind.

Patterson-Kelley Co., 26 Cortlandt St., New York

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

Power Plant Specialty Co., 1306 Monadnock Bldg., Chicago, Ill.

Robertson & Sons, Jas. L. (Hine), 78-80 Murray St., New York

Ross Schofield Co., 17 Battery Place, New York

Sims Co., Erie, Pa.
Steam Appliance Co., West Allis, Wis.

Steam Equipment Mfg. Co., 8077 Jenkins Arcade Bldg., Pittsburgh, Pa.

Vance-Vetter Co., Phipps Power Bldg., Pittsburgh, Pa.

WEBSTER & CO. WARREN, Camden, N. J... *pp. 108, 109, 110*

SET COLLARS

(See Collars, Shaft)

SETTING-UP APPLIANCES (For Machine Tools)

STANDARD SHOP EQUIPMENT CO., 1313 Somerset St., Philadelphia, Pa... *p. 384*

SEWAGE EJECTORS

(See Ejectors, Sewage)

SHACKLES, CHAIN

Weimer Chain & Iron Co., Lebanon, Pa.

SHAFTING**—Cold Drawn**

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 490*

Blum & Co., Julius, 510-512 W. 24th St., New York

Compressed Steel Shafting Co., 393 Dorchester Ave., Boston, Mass.

Cumberland Steel Co., Cumberland, Md.

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... *pp. 202, 203, 204, 205, 206*

Fitzsimmons Co., Youngstown, O.

*HILL CLUTCH CO., Cleveland, O... *p. 208*

Medart Patent Pulley Co., St. Louis, Mo.

Pardee Works, C. Perth Amboy, N. J.

*UNION DRAWN STEEL CO., Beaver Falls, Pa... *p. 300*

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp. 258, 259, 260*

—Flexible

Chicago Flexible Shaft Co., 579 La Salle Ave., Chicago, Ill.

Coates Clipper Mfg. Co., 237 Chandler St., Worcester, Mass.

Gem Mfg. Co., 1229-43 Goebel St., N. S., Pittsburgh, Pa.

Oliver Instrument Co., Adrian, Mich.

Plank Flexible Shaft Machine Co., Grand Rapids Mich.

Stow Flexible Shaft Co., 26th & Callowhill Sts., Philadelphia, Pa.

Stow Mfg. Co., 443 State St., Binghamton, N. Y.

Webb Mfg. Co., Foot of Centre St., Newark, N. J.

White Dental Mfg. Co., S. S., 211 S. 12th St., Philadelphia, Pa.

SHAPTING (Continued)**—Forged**

Crucible Steel Forge Co., 6607 Grant Ave., Cleveland, O.

—Forged and Turned

*HILL CLUTCH CO., Cleveland, O... *p. 208*

—Turned and Ground

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 490*

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*

Cumberland Steel Co., Cumberland, Md.
DODGE SALES & ENGINEERING CO.,
Mishawaka, Ind... *pp. 202, 203, 204, 205, 206*

*UNION DRAWN STEEL CO., Beaver Falls, Pa... *p. 300*

WELLER MFG. CO., 1820-1856 N. Kostner Ave., Chicago, Ill... *pp. 258, 259, 260*

—Turned and Polished

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 490*

Bliss & Laughlin, Inc., Harvey, Ill.

Brightman Mfg. Co., So. Columbus, O.

*BROWN CO., A. & F., 79 Barclay St., New York... *p. 187*

*CALDWELL & SON CO., H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*

Central Steel & Wire Co., 119 N. Peoria St., Chicago, Ill.

Columbia Steel & Shafing Co., Pittsburgh, Pa.
DODGE SALES & ENGINEERING CO.,
Mishawaka, Ind... *pp. 202, 203, 204, 205, 206*

*FALLS CLUTCH & MACHINERY CO.,
Cuyahoga Falls, O... *p. 207*

*HILL CLUTCH CO., Cleveland, O... *p. 208*

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*

*UNION DRAWN STEEL CO., Beaver Falls, Pa... *p. 300*

*WOOD'S SONS CO., T. B., Chambersburg, Pa... *pp. 212, 213*

Sha SHAKING GRATES

(See Grates, Shaking)

SHAPER ATTACHMENTS

Stockbridge Machine Co., Worcester, Mass.

SHAPERS

American Tool Works Co., Pearl & Eggleston Aves., Cincinnati, O.

Boynton & Plummer, Inc., Chester Depot, Vt.

Cincinnati Shaper Co., Cincinnati, O.

Cochrane-Bly Co., Rochester, N. Y.

Davis Machine Tool Co., Inc., 305 St. Paul St., Rochester, N. Y.

Gould & Eberhardt, Chancellor Ave., Irvington, N. J.

Hendey Machine Co., Torrington, Conn.

Hollingsworth Machine Tool Co., 2nd & Greenup Sts., Covington, Ky.

LYND-FARQUHAR CO., Boston, Mass... *p. 348*

Milwaukee Shaper & Transmission Appliance Co., 1148-50 Holton St., Milwaukee, Wis.

Morton Mfg. Co., Muskegon Heights, Mich.

Ohio Machine Tool Co., Kenton, O.

Potter & Johnson Machine Co., Pawtucket, R. I.

PRATT & WHITNEY CO., 111 Broadway, New York... *p. 344*

Rhodes Mfg. Co., Hartford, Conn.

Smith & Mills Co., Cincinnati, O.

Springfield Machine Tool Co., Springfield, O.

Stephoe, Co., John, Cincinnati, O.

Stockbridge Machine Co., Worcester, Mass.

—Draw Cut

Morton Mfg. Co., Muskegon Heights, Mich.

—Heavy Duty

Morton Mfg. Co., Muskegon Heights, Mich.

—Pillar

Cincinnati Shaper Co., Cincinnati, O.

Columbia Machine Tool Co., Fairgrove Ave., Hamilton, O.

Morton Mfg. Co., Muskegon Heights, Mich.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Queen City Machine Tool Co., 1405 Sycamore St., Cincinnati, O.

SHAPES**—Iron**

*UNION DRAWN STEEL CO., Beaver Falls, Pa... *p. 300*

Pressed Steel

AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa... *p. 200*

GLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa... *p. 68*

WORCESTER PRESSED STEEL CO., Worcester, Mass... *p. 305*

—Steel

Franklin Steel Works, Franklin, Pa.

GLASGOW IRON CO., 15th & Market Sts., Philadelphia, Pa... *p. 68*

Hamilton & DeLoos, Bridgeport, Conn.

Jones & Laughlin Steel Co., 3rd Ave. & Ry., Pittsburgh, Pa.

Phoenix Iron Co., 410 Walnut St., Philadelphia, Pa.

*UNION DRAWN STEEL CO., Beaver Falls, Pa... *p. 300*

—Steel (Cold Drawn)

Lancaster Steel Products Co., Lancaster, Pa.

*UNION DRAWN STEEL CO., Beaver Falls, Pa... *p. 300*

—Structural

Bethlehem Steel Co., South Bethlehem, Pa.

McDermott Engineering Co., Whitehall & Jordan Sts., Allentown, Pa.

SHARPENING DEVICES

Chicago Wheel & Mfg. Co., 1101-1103 W. Monroe St., Chicago, Ill.

INGERSOLL-RAND CO., 11 Broadway, New York... *pp. 428, 429*

SHARPENING STONES

(See Stones, Sharpening)

SHEARS**—Angle**

Badger State Machine Co., Janesville, Wis.

Hilles & Jones Co., Wilmington, Del.

Kidder Mfg. Co., J. F., Burlington, Vt.

LONG & ALLSTATTER CO., Hamilton, O... *p. 309*

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

WATSON-STILLMAN CO., 35 Church St., New York... *p. 457*

Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill.

WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

—Bar

Badger State Machine Co., Janesville, Wis.

Hendley & Whittemore Co., Beloit, Wis.

LONG & ALLSTATTER CO., Hamilton, O... *p. 309*

Massillon Foundry & Machine Co., Massillon, O.

Newbold & Son Co., R. S., Norristown, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Pels & Co., Henry, 90 West St., New York

TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*

WATSON-STILLMAN CO., 35 Church St., New York

WILLIAMS, WHITE & CO., Moline, Ill... *p. 314*

Youngstown Foundry & Machine Co., Youngstown, O.

—Circle

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *pp. 310, 311*

Newbold & Son Co., R. S., Norristown, Pa.

Quickwork Co., St. Marys, O.

TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*

TORRINGTON MFG. CO., Torrington, Conn... *p. 483*

Advertisements of firms marked * appear in *The Journal, A. S. M. E.*

-GateLONG & ALLSTATTER CO., Hamilton, O...
*p. 309*NILES-BEMENT-POND CO., 111 Broadway,
New York...*p. 344*SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa...*p. 456*TOLEDO MACHINE & TOOL CO., Toledo, O...
*p. 313*WILLIAMS, WHITE & CO., Moline, Ill...*p. 314*WOOD & CO., R. D., Philadelphia, Pa...*p. 458***-Hydraulic**ALLIANCE MACHINE CO., Alliance, O...*p. 264*SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa...
*p. 456*WATSON-STILLMAN CO., 35 Church St.,
New York...*p. 457*WOOD & CO., R. D., Philadelphia, Pa...*p. 458***-Irregular Cutting**

Quickwork Co., St. Marys, O.

-Metal (Hand Power)

Badger State Machine Co., Janesville, Wis.

Heartley Machine, Variety Iron & Tool Works,
Summit & Locust Sts., Toledo, O.

Hendley & Whittemore Co., Beloit, Wis.

Oliver Mfg. Co., W. W., Buffalo, N. Y.

TORRINGTON MFG. CO., Torrington, Conn...
p. 483

Tucker, W. R. & C. F., Hartford, Conn.

Viking Shear Co., Erie, Pa.

-Plate

Badger State Machine Co., Janesville, Wis.

Hilles & Jones Co., Wilmington, Del.

LONG & ALLSTATTER CO., Hamilton, O...
p. 309

Newbold & Son Co., R. S., Norristown, Pa.

NILES-BEMENT-POND CO., 111 Broadway,
New York...*p. 344*

Quickwork Co., St. Marys, O.

WATSON-STILLMAN CO., 35 Church St.,
New York...*p. 457*WILLIAMS, WHITE & CO., Moline, Ill...*p. 314*WOOD & CO., R. D., Philadelphia, Pa...*p. 458***-Power**

Badger State Machine Co., Janesville, Wis.

BLISS CO., E. W., 19 Adams St., Brooklyn,
N. Y...*pp. 310, 311*

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Canton Foundry & Machine Co., Canton, O.

Cedar Rapids Foundry & Machine Co., 901-908
2nd Ave., W., Cedar Rapids, Iowa

Clark Foundry Co., Rumford, Me.

Cleveland Punch & Shear Works Co., Cleveland,
O.

Covington Machine Co., Covington, Va.

Imperial Machine Co., 1611 Central Ave.,
Minneapolis, Minn.

Ironton Punch & Shear Co., Ironton, O.

LONG & ALLSTATTER CO., Hamilton, O...
*p. 309*Loy & Nawrath Co., 21-29 Runyon St., Newark,
N. J.

Massillon Foundry & Machine Co., Massillon, O.

NILES-BEMENT-POND CO., 111 Broadway,
New York...*p. 344*

Schatz Mfg. Co., Poughkeepsie, N. Y.

TOLEDO MACHINE & TOOL CO., Toledo,
O...*p. 313*WILLIAMS-WHITE & CO., Moline, Ill...
*p. 314***-Rotary**BLISS CO., E. W., 19 Adams St., Brooklyn,
N. Y...*pp. 310, 311*

Ham Co., L. M., 150 Portland St., Boston, Mass.

NIAGARA MACHINE & TOOL WORKS,
Buffalo, N. Y...*p. 312*

Quickwork Co., St. Marys, O.

TOLEDO MACHINE & TOOL CO., Toledo,
O...*p. 313*TORRINGTON MFG. CO., Torrington, Conn...
*p. 483***-Slitting**

Quickwork Co., St. Marys, O.

-Squaring

Aetna Foundry & Machine Co., Warren, O.

BLISS CO., E. W., 19 Adams St., Brooklyn,
N. Y...*pp. 310, 311*

Ironton Punch & Shear Co., Ironton, O.

LONG & ALLSTATTER CO., Hamilton, O...
*p. 309*NIAGARA MACHINE & TOOL WORKS, Buf-
falo, N. Y...*p. 312*NILES-BEMENT-POND CO., 111 Broadway,
New York...*p. 344*

Stoll Co., D. H., 26 Lansing St., Buffalo, N. Y.

TOLEDO MACHINE & TOOL CO., Toledo, O...
*p. 313*WILLIAMS-WHITE & CO., Moline, Ill...*p. 314***SHEAVES****-Chain***POOLE ENGINEERING & MACHINE CO.,
Woodberry, Baltimore, Md...*pp. 196, 197***-Rope**AMERICAN PULLEY CO., 4200 Wissahickon
Ave., Philadelphia, Pa...*p. 200*BASS FOUNDRY & MACHINE CO., Fort
Wayne, Ind...*p. 35**BROWN CO., A. & F., 79 Barclay St., New
York...*p. 187**CALDWELL & SON CO., H. W., 17th St. &
Western Ave., Chicago, Ill...*p. 250**CLYDE IRON WORKS, 29th Ave., W., &
Michigan St., Duluth, Minn...*p. 268*DODGE SALES & ENGINEERING CO.,
Mishawaka, Ind...*pp. 202, 203, 204, 205, 206*

Ehram & Sons Mfg. Co., J. B., Enterprise, Kan.

*FALLS CLUTCH & MACHINERY CO.,
Cuyahoga Falls, O...*p. 207**FULLER-LEHIGH CO., Fullerton, Pa...*p. 92**HILL CLUTCH CO., Cleveland, O...*p. 208**LINK-BELT CO., 39th St. & Stewart Ave.,
Chicago, Ill...*p. 256*Litchfield Foundry & Machine Co., Litchfield,
Ill.

Medart Patent Pulley Co., St. Louis, Mo.

Ottumwa Iron Works, Ottumwa, Ia.

Patterson Co., W. W., 45 Water St., Pittsburgh,
Pa.WELLER MFG. CO., 1820-1856 N. Kostner
Ave., Chicago, Ill...*pp. 258, 259, 260*WELLMAN-SEEVER MORGAN CO., 7000
Central Ave., Cleveland, O...*p. 272***-V-Belt**DODGE SALES & ENGINEERING CO.,
Mishawaka, Ind...*pp. 202, 203, 204, 205, 206***SHEET METAL WORK**Allington & Curtis Mfg. Co., 400 Holden St.,
Saginaw, Mich.DILLON STEAM BOILER WORKS, D. M.,
Fitchburg, Mass...*pp. 44, 45*Gem Mfg. Co., 1229-43 Goebel St., N. S., Pitts-
burgh, Pa.

Hamilton & DeLoss, Bridgeport, Conn.

Hodge Boiler Works, 99 Sumner St., East Bos-
ton, Mass.

Howard & Morse, 45 Fulton St., New York

KEELER CO., E., Williamsport, Pa...*p. 31*KROESCHELL BROS. CO., 460 West Erie St.,
Chicago, Ill...*p. 56*

Merrill, Inc., C. J., 131 Preble St., Portland, Me.

MILWAUKEE RELIANCE BOILER WORKS,
Milwaukee, Wis...*p. 112*National Blow Pipe & Mfg. Co., 738 Dryades
St., New Orleans, La.Nazareth Foundry & Machine Co., 41-45 Easton
Road, Nazareth, Pa.

Northern Blower Co., Cleveland, Ohio

Richmond Engineering Co., 12 S. 8th St., Rich-
mond, Va.SKINNER BROS. MFG. CO., 10th & Tyler
Sts., St. Louis, Mo...*p. 476*

She

SHEET METAL WORK (Continued)

STERLING BLOWER CO., Hartford, Conn...
p. 436
Van Noorden Co., E., 102 Magazine St., Rox-
bury, Mass.
WILLCOX ENGINEERING CO., Saginaw,
Mich... p. 516
Wilson Steam Boiler Co., 1919-27 S. 20th St.,
Omaha, Neb.

SHEET METAL WORKING MACHINERY

BLISS CO., E. W., 19 Adams St., Brooklyn,
N. Y... pp. 310, 311
Dreis Krump Mfg. Co., 2919 So. Halsted St.,
Chicago, Ill.

Leffler & Co., Charles, 49-73 Clymer St., Brook-
lyn, N. Y.

Loy & Nawrath Co., 21-29 Runyon St., Newark,
N. J.

NIAGARA MACHINE & TOOL WORKS,
Buffalo, N. Y... p. 312

NILES-BEMENT-POND CO., 111 Broadway,
New York... p. 344

Pettingell Machine Co., Amesbury, Mass.

Poorman Co., O. O., New Bremen, O.

Quickwork Co., St. Marys, O.

Stoll Co., D. H., 26 Lansing St., Buffalo, N. Y.

TOLEDO MACHINE & TOOL CO., Toledo,
O... p. 313

TORRINGTON MFG. CO., Torrington, Conn.
... p. 483

V & O Press Co., Glendale, L. I., N. Y.

Waterbury Farrel Foundry & Machine Co.,
Waterbury, Conn.

Yoder Co., 1024 B. of L. E. Bldg., Cleveland, O.

SHEETS**—Aluminum**

Cleveland Metal Products Co., 7609 Platt Ave.,
Cleveland, O.

—Brass

Bristol Brass Co., Bristol, Conn.

Scovill Mfg. Co., Waterbury, Conn.

—Fibre

*CONTINENTAL FIBRE CO., Newark, Del...
p. 297

—Galvanized

American Sheet & Tin Plate Co., Pittsburgh, Pa.

—Hard Rubber

Stokes Rubber Co., Jos., Trenton, N. J.

—Nickel

Haring, Ellsworth, 114 Liberty St., New York

—Steel

Allegheny Steel Co., Pittsburgh, Pa.

Andrews Steel Co., Newport, Ky.

MARK MFG. CO., P. O. Box G, Chicago, Ill.
... p. 160

Otis Steel Co., 3131 Lakeside Ave., Cleveland, O.

UNITED LEAD CO., 111 Broadway, New York.
... p. 299

WHEELOCK, LOVEJOY & CO., 23 Cliff St.,
New York... p. 301

Wood, Iron & Steel Co., Alan, Widener Bldg,
Philadelphia, Pa.

Youngstown Sheet & Tube Co., Youngstown, O

—Tin

UNITED LEAD CO., 111 Broadway, New
York... p. 299

—Zinc

Hazel Atlas Glass Co., Wheeling, W. Va.

Illinois Zinc Co., Peru, Ill.

SHELL MAKING MACHINERY

Bryant Co., 58th & Filmore Sts., Chicago, Ill.

Gray Machine Tool Co., Inc., 1665 Main St.,
Buffalo, N. Y.

HOUSTON, STANWOOD & GAMBLE CO.,
Cincinnati, O... pp. 48, 49, 321

INTERNATIONAL MACHINE TOOL CO.,
1124 W. 21st St., Indianapolis, Ind... pp. 322,
323

*JONES & LAMSON MACHINE CO., Spring-
field, Vt... pp. 324, 325, 326, 327

NILES-BEMENT-POND CO., 111 Broadway,
New York... p. 344

NOBLE & WESTBROOK MFG. CO., Hartford,
Conn... p. 368

SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa... p.
456

STEINLE TURRET MACHINE CO., Madison,
Wis... p. 332

TOLEDO MACHINE & TOOL CO., Toledo, O
... p. 313

WATSON-STILLMAN CO., 35 Church St.,
New York... p. 457

WILLIAMS, WHITE & CO., Moline, Ill... p.
314

WOOD & CO., R. D., Philadelphia, Pa... p. 458

SHELLS, LAP WELDED**—Boiler**

American Welding Co., Carbondale, Pa.

*CASEY-HEDGES CO., Chattanooga, Tenn...
pp. 42, 43

DILLON STEAM BOILER WORKS, D. M.,
Fitchburg, Mass... pp. 44, 45

KEELER CO., E., Williamsport, Pa... p. 51

—Ice Machine

American Welding Co., Carbondale, Pa.

*CASEY-HEDGES CO., Chattanooga, Tenn...
pp. 42, 43

SHELVING, METAL

Darby & Sons Co., Inc., Edward, 233-235 Arch
St., Philadelphia, Pa.

Dexter Metal Mfg. Co., Camden, N. J.

Durand Steel Locker Co., 76 W. Monroe St.,
Chicago, Ill.

EDWARDS MFG. CO., 306-336 Eggleston Ave.,
Cincinnati, O... p. 506

Lyon Metallic Mfg. Co., Aurora, Ill.

National Scale Co., Chicopee Falls, Mass.

NEW BRITAIN MACHINE CO., New Britain,
Conn... p. 336

NEWHALL CHAIN FORGE & IRON CO., 90
West St., New York... p. 279

Snead & Co. Iron Works, Foot of Pine St., Jer-
sey City, N. J.

Terrell's Equipment Co., Grand Rapids, Mich.

WRIGHT WIRE CO., Worcester, Mass... p. 282

SHIP CABLES

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J... p. 281

SHIP STEERING ENGINES

(See Engines, Steering)

SHIPYARD MACHINERY

Norbom Engineering Co., 712 Denckla Bldg.,
Philadelphia, Pa.

SHOE LACE TIPPING MACHINES

Franklin Machine Co., 189 Charles St., Prov-
idence, R. I.

SHOE MAKING MACHINERY

Freeman Co., Louis G., Cincinnati, Ohio

SHOP FURNITURE

Manufacturing Equipment & Engineering Co.,
Framingham, Mass.

NEW BRITAIN MACHINE CO., New Britain,
Conn... p. 336

Western Tool & Mfg. Co., Springfield, O.

SHOVEL MAKING MACHINERY

TOLEDO MACHINE & TOOL CO., Toledo, O.
... p. 313

SHOVELING MACHINES

Lake Shore Engine Works, Marquette, Mich.

Myers-Whaley Co., Knoxville, Tenn.

SHOVELS, STEAM

*BALL ENGINE CO., Erie, Pa... p. 16

Bucyrus Co., South Milwaukee, Wis.

Keystone Driller Co., Beaver Falls, Pa.

Marion Steam Shovel Co., Marion, O.

Osgood Co., Marion, O.

Thew Automatic Shovel Co., Lorain, Ohio

Toledo Foundry & Machine Co., Toledo, Ohio

SHERDDING MACHINERY

STROUD & CO., E. H., 928-934 Fullerton Ave.,
Chicago, Ill... pp. 466, 467

She

***WILLIAMS PATENT CRUSHER & PULVERIZER CO.**, Old Colony Bldg., Chicago, Ill... *p. 468, 469*

SHUTTERS, ROLLING
EDWARDS MFG. CO., 306-386 Eggleston Ave., Cincinnati, O... *p. 506*

SIGHT FEEDS
LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... *p. 127, 528*
RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *p. 170, 171*

SIGNALS, INDUSTRIAL
BENJAMIN ELECTRIC MFG. CO., 122 S. Sangamon St., Chicago, Ill... *p. 504*

SILENCERS, GAS ENGINE
Maxim Silencer Co., Hartford, Conn.

SILK MACHINERY
Franklin Machine Co., 189 Charles St., Providence, R. I.

Saco-Lowell Shops, 77 Franklin St., Boston, Mass.

SINTERING PLANT MACHINERY
BARTLETT & SNOW CO., C. O., Cleveland, O... *p. 249*

SIPHONS, STEAM
AMERICAN INJECTOR CO., Detroit, Mich... *p. 151*

Ohio Injector Co., S. Main St., Wadsworth, O.
PENBERTHY INJECTOR CO., Detroit, Mich... *p. 152, 153*

Standard Scientific Co., 70 Fifth Ave., New York

SIRENS
(See Whistles, Steam)

SKYLIGHT GEARING
Lupton's Sons Co., David, Allegheny Ave. & Tulip St., Philadelphia, Pa.

Thorn Co., J. S., 20th & Allegheny Ave., Philadelphia, Pa.

SKYLIGHTS, STEEL
Aspromet Co., First National Bank Bldg., Pittsburgh, Pa.

Drouve Co., G., Bridgeport, Conn.
EDWARDS MFG. CO., 306-386 Eggleston Ave., Cincinnati, O... *p. 506*

Keighley Metal Ceiling & Mfg. Co., S. 124 3rd Ave., Pittsburgh, Pa.

Thorn Co., J. S., 20th & Allegheny Ave., Philadelphia, Pa.

Van Noorden Co., E., 102 Magazine St., Roxbury, Mass.

SLABS, STEEL
American Tube & Stamping Co., Bridgeport, Conn.

SLATE WORKING MACHINERY
FLORY, MFG. CO., S. Bangor, Pa... *p. 269*

SLEEVES (Propeller Shaft)
SANDUSKY FOUNDRY & MACHINE CO., Sandusky, O... *p. 488*

SLIDING DOOR EQUIPMENT
COBURN TROLLEY TRACK MFG. CO., Holyoke, Mass... *p. 276*

SLINGS
—Chain

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... *p. 279*

Weimer Chain & Iron Co., Lebanon, Pa.
Woodhouse Chain Works, Trenton, N. J.

—Wire Rope
MACOMBER & WHYTE ROPE CO., Kenosha, Wis... *p. 280*

***ROEBLING'S SONS CO.**, JOHN A., Trenton, N. J... *p. 281*

WRIGHT WIRE CO., Worcester, Mass... *p. 282*

SLITTING MACHINES
—For Knitting Machine Trade

***BILTON MACHINE TOOL CO.**, Bridgeport, Conn... *p. 353*

—Metal
BLAKE & JOHNSON CO., Waterbury, Conn... *p. 482*

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y... *p. 310, 311*

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

TOLEDO MACHINE & TOOL CO., Toledo, O... *p. 313*

TORRINGTON MFG. CO., Torrington, Conn... *p. 483*

SLOTTERS, MACHINE
Betts Machine Co., Rochester, N. Y.

DILL MACHINE CO., INC., T. C., Philadelphia, Pa... *p. 345*

Newton Machine Tool Works, Inc., 23rd & Vine Sts., Philadelphia, Pa.

NILES-BEMENT-POND CO., 111 Broadway, New York... *p. 344*

Rhodes Mfg. Co., Hartford, Conn.

SLUICE GATES
(See Gates, Sluices)

SMELTING MACHINERY
Industrial Electric Furnace Co., 1405 Monadnock Bldg., Chicago, Ill.

Traylor Engrg. & Mfg. Co., Allentown, Pa.
United Iron Works Co., Kansas City, Mo.

***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York... *p. 30, 117, 431, 447*

SMOKE RECORDERS
Hamler Eddy Smoke Recorder Co., 3906 S. Halsted St., Chicago, Ill.

SMOKE STACKS AND FLUES
(See Stacks, Steel)

SMOKELESS FURNACES
(See Furnaces, Smokeless)

SOCKETS, WIRE ROPE
(See Wire Rope Fastenings)

SOLDER
***DOEHLER DIE-CASTING CO.**, Brooklyn, Spe

N. Y... *p. 292*
Empire Metal Co., Syracuse, N. Y.

Jacobson & Sons, I. M. (Motex), 70-72 Catherine St., Detroit, Mich.

National Lead Co., 111 Broadway, New York
Pacific Metal Works, 153 First St., San Francisco, Cal.

Riverside Metal Refining Co., Connellsville, Pa.
Syracuse Smelting Works, 192 Diamond St., Brooklyn, N. Y.

***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa... *p. 114, 115*

—Silver
ATKINS & CO., INC., E. C., Indianapolis, Ind... *p. 385*

SOLVENT RECOVERY APPARATUS
BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... *p. 470*

SOOT BLOWING SYSTEMS
Bayer Steam Soot Blower Co., 2828-2840 LaSalle St., St. Louis, Mo.

Diamond Power Specialty Co., 80 First St., Detroit, Mich.

***EDGE MOOR IRON CO.**, Edge Moor, Del... *p. 46*

Monarch Soot Remover Co., Inc., 261 Franklin St., Boston, Mass.

Vulcan Soot Cleaner Co., DuBois, Pa.

SPACING TABLES (Structural Shop)
Steel Utilities, Inc., 425 Kinney Bldg., Newark, N. J.

Thomas Spacing Machine Co., 1226 Fulton Bldg., Pittsburgh, Pa.

SPARK PLUGS
(See Plugs, Spark)

SPECIAL MACHINERY
Advance Mfg. Co., Hamilton, O.

Akron Gear & Engineering Co., Cor. South & High Sts., Akron, O.

SPECIAL MACHINERY (Continued)

American & British Mfg. Co., Bridgeport, Conn.
 American Insulating Machinery Co., Inc., Fairhill & Huntington Sts., Philadelphia, Pa.
 American Machine & Foundry Co., 250 Second Ave., Brooklyn, N. Y.
ANDERSON FOUNDRY & MACHINE WORKS, Anderson, Ind., p. 27
 Atlas Machine Co., 140 Manhan St., Waterbury, Conn.
 Bickett Machine & Mfg. Co., Cincinnati, O.
 Boeger-Meyer Machine & Tool Co., 59-65 McWhorter St., Newark, N. J.
 Bradley Mach. Co., Bridgeport, Conn.
 Bridgeport Engineering Co., Bridgeport, Conn.
 *BROWN CO., A. & F., 79 Barclay St., New York... p. 187
 Brown Engine Co., Fitchburg, Mass.
BURROUGHS CO., CHARLES, Newark, N. J. ... p. 454
 Cawoll Foundry & Machine Co., Bucyrus, O.
 Centre Foundry & Machine Co., Wheeling, W. Va.
 Chickasaw Machine & Foundry Co., Memphis, Tenn.
 City Machine & Tool Works, Dayton, Ohio
 Clark Bros. Co., Olean, N. Y.
 *CLYDE IRON WORKS, 29th Ave., W., & Michigan St., Duluth, Minn., p. 268
 Colton Co., Arthur, Jefferson Ave., Detroit, Mich.
 Columbia Machine Tool Co., Fairgrove Ave., Hamilton, O.
 Cowdrey Machine Works, C. H., 20 Main St., Fitchburg, Mass.
 *CRAMP & SONS SHIP & ENGINE BLDG. CO., WM. (I. P. Morris Dept.), Richmond & Norris Sts., Philadelphia, Pa., pp. 450, 451
 Diamant Tool & Mfg. Co., 164 Emmett St., Newark, N. J.
 Eastwood Co., Benjamin, Paterson, N. J.
 Emery, A. H., Maple Ave., Glenwood, Conn.
 Engine & Machinery Co., Canton, O.
 Enterprise Co., Columbiana, Ohio
 Exeter Machine Works, Pittston, Pa.
 *FAWCUS MACHINE CO., Pittsburgh, Pa., pp. 190, 191
 Franklin Machine Co., 189 Charles St., Providence, R. I.
 Gerdes Co., Inc., 30 Church St., New York
GIDDINGS & LEWIS MFG. CO., Fond du Lac, Wis., p. 342
 Griswold Machine Co., Geo. M., New Haven, Conn.
HALL MFG. CO., Abington, Mass., p. 379
 Hanson Clutch & Machinery Co., Tiffin, O.
 Hart & Co., Inc., Frederick, 837 Main St., Poughkeepsie, N. Y.
 Hartford Special Machinery Co., Hartford, Conn.
 Hinsman Machine & Tool Co., Elm St., Westfield, Mass.
HOGGSON & PETTIS MFG. CO., New Haven, Conn., pp. 394, 395, 396
 Horn & Hardart Baking Co., 21 S. 11th St., Philadelphia, Pa.
 Johnston & Jennings Co., Cleveland, O.
JONES FOUNDRY & MACHINE CO., W. A., 4401 W. 12th St., Chicago, Ill., p. 194
 Keller Pneumatic Tool Co., Grand Haven, Mich.
 Kent Machine Co., Kent, O.
 Kotten Machine Co., West Side Ave. & Penn R. R., Jersey City, N. J.
KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J., p. 494
 Krasberg Mfg. Co., 536 Lake Shore Drive, Chicago, Ill.
 Lake Erie Engineering Works, Buffalo, N. Y.
 *LAMBERT & MANN CO., Wood & Walnut Sts., Chicago, Ill., p. 448
 Leavitt Mfg. Co., Urbana, Ill.
 Lincoln Iron Works, 255 West St., Rutland, Vt.
LYND-FARQUHAR CO., Boston, Mass., p. 348
 Mantle & Co., 1907 Park Ave., New York
MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa., p. 496
 Marvin & Casler Co., Canastota, N. Y.

McCall Machine Works, Rochester, N. Y.
MEHL MACHINE TOOL & DIE CO., Roselle, N. J., pp. 376, 377
 Meriden Press & Drop Co., 153 State St., Meriden, Conn.
 Moline Machinery Co., Cor. 3rd Ave. & 20th St., Moline, Ill.
 Munson, E. G., Canton Ave., Utica, N. Y.
NELSON BLOWER & FURNACE CO., 11 Elkins St., Boston, Mass., p. 67
 Nestor Mfg. Co., 40 W. 13th St., New York
 Nilson Machine Co., A. H., 1525 Railroad Ave., Bridgeport, Conn.
 Nilson-Miller Co., 1300 Hudson St., Hoboken, N. J.
OIL CITY BOILER WORKS, Oil City, Pa., p. 58
 Pittsburgh Instrument & Machine Co., 101 Water St., Pittsburgh, Pa.
 *POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md., pp. 196, 197
 Powdered Coal Engrg. & Equipment Co., 2415 Washington Blvd., Chicago, Ill.
 Pratt Engineering & Machine Co., Atlanta, Ga.
 Production Tool & Engineering Co., 507 Jackson Boulevard, Chicago, Ill.
 Redington & Co., F. B., 112 S. Sangamon St., Chicago, Ill.
 Richmond Metal Products Co., Inc., 5th & Arch Sts., Richmond, Va.
RIEHL BROS. TESTING MACHINE CO., 1424 N. 9th St., Philadelphia, Pa., p. 512
 Robbins, Gamwell & Co., Pittsfield, Mass.
 Ruger Mfg. Co., J. W., 222 Chicago St., Buffalo, N. Y.
 Russel Wheel & Foundry Co., Detroit, Mich.
 Sanford Mfg. Co., F. C., Bridgeport, Conn.
 Sheffield Machine & Tool Co., Dayton, O.
 Shepherd Engineering Co., Williamsport, Pa.
 Sigourney Tool Co., 9 Sigourney St., Hartford, Conn.
SLOAN & CHACE MFG. CO., LTD., Sixth Ave., Cor. N. 13th St., Newark, N. J., p. 357
 Smalley-General Co., Bay City, Mich.
 Spafford Tool Works, 10 Hoadley Place, Hartford, Conn.
 Steacy-Schmidt Mfg. Co., 230 E. Hay St., York, Pa.
TORRINGTON MFG. CO., Torrington, Conn., p. 483
 Turley Gear & Machine Co., 1505 N. 10th St., St. Louis, Mo.
 Turner-Fricke Mfg. Co., Pittsburgh, Pa.
 Ulmer Co., J. C., 1791 E. 38th St., Cleveland, O.
 Varick Engineering & Machine Wks., Johnson & Varick Aves., Brooklyn, N. Y.
 Walker Bros. Co., 227 Walton St., Syracuse, N. Y.
 Walsh Press & Die Co., 4709 W. Kinzie St., Chicago, Ill.
 Waltham Machine Works, Waltham, Mass.
 Watertown Engine & Machine Co., Watertown, N. Y.
WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O., p. 365
 Wilson Machine Co., W. A., 217 N. Water St., Rochester, N. Y.
 Yoder Co., 1024 B. of L. E. Bldg., Cleveland, O.
 York Electric & Machine Co., 30-34 N. Penn St., York, Pa.
SPEED REDUCING GEARS
 (See Gears, Speed Reduction)
SPIKE MACHINES
 Youngstown Foundry & Machine Co., Youngstown, O.
SPIRAL CONVEYORS
 (See Conveyors, Screw)
SPOOLS, METAL
AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa., p. 200
SPOT-SETTING MACHINES
 Smith Mfg. Co., F. H., 3037-3047 Carroll Ave., Chicago, Ill.
SPRAY COOLING SYSTEMS
BRAEMER AIR CONDITIONING CORP'N., Lafayette Bldg., Philadelphia, Pa., p. 470

***SPRAY ENGINEERING CO.**, 93 Federal St., Boston, Mass... *p. 113*
 Star Brass Works, 3114-20 Carroll Ave., Chicago, Ill.

SPRAY NOZZLES
 (See Nozzles, Spray)

SPRAYING MACHINERY

—**Metal**

Metals Coating Co. of America, 100 Summer St., Boston, Mass.

—**Paint**

***SPRAY ENGINEERING CO.**, 93 Federal St., Boston, Mass... *p. 113*

SPRAYS

—**Chemical and Industrial Purposes**

ANTHONY CO., 138 West Ave., Long Island City, N. Y... *p. 410*

***SPRAY ENGINEERING CO.**, 93 Federal St., Boston, Mass... *p. 113*

Star Brass Works, 3114-20 Carroll Ave., Chicago, Ill.

—**Oil**

ANTHONY CO., 138 West Ave., Long Island City, N. Y... *p. 410*

PARKS CO., G. M., Fitchburg, Mass... *p. 472*

***SPRAY ENGINEERING CO.**, 93 Federal St., Boston, Mass... *p. 113*

TATE-JONES & CO., INC., Pittsburgh, Pa... *pp. 416, 417*

—**Water**

American Spray Co., 26 Cortlandt St., New York City, N. Y... *p. 410*

***SPRAY ENGINEERING CO.**, 93 Federal St., Boston, Mass... *p. 113*

—**Water, Adjustable**

***YARNALL-WARING CO.** (Yarway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa... *p. 139*

SPRING BALANCES

(See Balances, Spring)

SPRING MAKING MACHINES

Baird Machine Co., Bridgeport, Conn.

SLEEPER & HARTLEY, INC., Worcester, Mass... *p. 486*

SPRING TESTING MACHINES

OLSEN TESTING MACHINE CO., TINIUS, 500 N. 12th St., Philadelphia, Pa... *p. 511*

RIEHLÉ BROS. TESTING MACHINE CO., 1424 N. 9th St., Philadelphia, Pa... *p. 512*

SPRINGS

—**Car and Locomotive**

Liggett Spring & Axle Co., Monongahela, Pa. Pittsburgh Spring & Steel Co., 1417 Farmers Bank Bldg., Pittsburgh, Pa.

Railway Steel Spring Co., 30 Church St., New York

UNION SPRING & MFG. CO., 1207 Fulton Bldg., Pittsburgh, Pa... *p. 424*

—**Coiled**

Barnes Co., Wallace, Main St., Bristol, Conn. Cook Spring Co., 420 E. 106th St., New York

New York Wire & Spring Co., 586 Washington St., New York

UNION SPRING & MFG. CO., 1207 Fulton Bldg., Pa... *p. 424*

—**Elliptic**

UNION SPRING & MFG. CO., 1207 Fulton Bldg., Pittsburgh, Pa... *p. 424*

—**Machinery**

Barnes Co., Wallace, Main St., Bristol, Conn. Pittsburgh Spring & Steel Co., 1417 Farmers Bank Bldg., Pittsburgh, Pa.

Raymond Mfg. Co., Ltd., Corry, Pa. UNION SPRING & MFG. CO., 1207 Fulton Bldg., Pittsburgh, Pa... *p. 424*

—**Steel**

Cary Spring Works, 240 W. 29th St., New York Miller Wire Spring Co. (Oil Tempered), Bridgeport, Conn.

New York Wire & Spring Co., 586 Washington St., New York

Pittsburgh Spring & Steel Co., 1417 Farmers Bank Bldg., Pittsburgh, Pa.

—**Vanadium**

Barnes Co., Wallace, Main St., Bristol, Conn. Cook Spring Co., 420 E. 106th St., New York

New York Wire & Spring Co., 586 Washington St., New York

Raymond Mfg. Co., Ltd., Corry, Pa.

—**Vehicle (Flat Leaf)**

Hess Spring & Axle Co., 124 W. 66th St., Carthage, Cincinnati, O.

Sheldon Axle & Spring Co., Wilkes-Barre, Pa. Standard Parts Co., Cleveland, O.

—**Wire**

Barnes Co., Wallace, Main St., Bristol, Conn. Bridgeport Chain Co., Bunnell St. & Crescent Ave., Bridgeport, Conn.

Cook Spring Co., 420 E. 106th St., New York Cuyahoga Spring Co., Waterloo Road, Cleveland, Ohio

Miller Wire Spring Co., Bridgeport, Conn. New York Wire & Spring Co., 586 Washington St., New York

Raymond Mfg. Co., Ltd., Corry, Pa.

SPRINKLER SYSTEMS, FIRE (Automatic)

General Fire Extinguisher Co., 277 W. Exchange St., Providence, R. I.

Globe Automatic Sprinkler Co., 2035 Washington Ave., Philadelphia, Pa.

Rockwood Sprinkler Co. of Mass., 34-56 Harlow St., Worcester, Mass.

SPRINKLERS

—**Automatic**

Automatic Sprinkler Co. of America, 123 William St., New York

Foskett & Bishop Co., New Haven, Conn. Globe Automatic Sprinkler Co., 2035 Washington Ave., Philadelphia, Pa.

PARKS CO., G. M., Fitchburg, Mass... *p. 472*

—**Spray**

***SPRAY ENGINEERING CO.**, 93 Federal St., Boston, Mass... *p. 113*

SPOCKETS

American High Speed Chain Co., 401 South Illinois St., Indianapolis, Ind.

AMERICAN TOOL & MACHINE CO., Boston, Mass... *p. 400*

***BALDWIN CHAIN & MFG. CO.**, Worcester, Mass... *p. 198*

***CALDWELL & SON CO.**, H. W., 17th St. & Western Ave., Chicago, Ill... *p. 250*

***CHAIN BELT CO.**, 735 Park St., Milwaukee, Wis... *pp. 118, 119*

Cullman Wheel Co., 1344 Altgeld St., Chicago, Ill.

DODGE SALES & ENGINEERING CO., Mishawaka, Ind... *pp. 202, 203, 204, 205, 206*

Ehrsam & Sons Mfg. Co., J. B., Enterprise, Kan.

***FULLER-LEHIGH CO.**, Fullerton, Pa... *p. 92*

Grant Gear Works, 151 Pearl St., Boston, Mass. Great Western Mfg. Co., Laporte, Ind.

***HILL CLUTCH CO.**, Cleveland, O... *p. 208*

***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill... *p. 256*

***MORSE CHAIN CO.**, Ithaca, N. Y... *p. 199*

ROBINS CONVEYING BELT CO., Park Row Bldg., New York... *p. 257*

Schultz & Son, A. L., 1675 Elston St., Chicago, Ill.

Turley Gear & Machine Co., 1505 N. 10th St., St. Louis, Mo.

Union Chain & Mfg. Co., Seville, O.

VAN DORN & DUTTON CO., Cleveland, O... *p. 370*

WELLER MFG. CO., 1820-1836 N. Kostner Ave., Chicago, Ill... *pp. 258, 259, 260*

***WOOD'S SONS CO.**, T. B., Chambersburg, Pa... *pp. 212, 213*

STACKS, STEEL

Abendroth Co., G. Irving, 10 E. 43rd St., New York

Sta

STACKS, STEEL (Continued)**BASS FOUNDRY & MACHINE CO.**, Fort Wayne, Ind., p. 35***BIGELOW CO.**, 76 River St., New Haven, Conn., p. 40***CASEY-HEDGES CO.**, Chattanooga, Tenn., pp. 42, 43**Codd Co.**, E. J., 700-708 S. Carolina St., Baltimore, Md.**COLE MFG. CO.**, R. D., Newnan, Ga., p. 41**Connery & Co., Inc.**, 2nd & Luzerne Sts., Philadelphia, Pa.**DILLON STEAM BOILER WORKS**, D. M., Fitchburg, Mass., pp. 44, 45**Dover Boiler Works**, 50 Church St., New York**Farrar & Trefits, Inc.**, Perry & Illinois Sts., Buffalo, N. Y.**FROST MFG. CO.**, 112 W. Adams St., Chicago, Ill., pp. 47, 462**Godfrey, Keeler Co.**, 70 Warren St., New York**Graver Tank Works**, Wm., 28 E. Jackson Blvd., Chicago, Ill.**Grupe Drier & Boiler Co.**, 325-331 E. Second St., Davenport, Ia.***HEINE SAFETY BOILER CO.**, St. Louis, Mo., p. 50**HOLMES & BROS.**, ROBT., Danville, Ill., p. 270**HOUSTON STANWOOD & GAMBLE CO.**, Cincinnati, O., pp. 48, 49, 321**Kaw Boiler Works Co.**, Kansas City, Mo.**KEELER CO.**, E., Williamsport, Pa., p. 51**Kittoe Boiler & Tank Co., Inc.**, Canton, O.**KOVEN & BROTHER**, L. O., 154 Ogden Ave., Jersey City, N. J., p. 494**KROESCHELL BROS. CO.**, 460 West Erie St., Chicago, Ill., p. 56**Lebanon Boiler Works**, Lebanon, Pa.**Leslie & Elliott Co.**, Cor. E. Railway & Iowa Ave., Paterson, N. J.**McAleenan Bros. Co.**, 25th & R. R. Sts., Pittsburgh, Pa.

Sta

McDermott Engineering Co., Whitehall & Jordan Sts., Allentown, Pa.**McNaull Boiler Mfg. Co.**, Toledo, O.**Meehan Boiler & Construction Co.**, Lowellville, O.**Michelmann Steel Construction Co.**, 121-141 N. Second St., Quincy, Ill.**Milwaukee Boiler Co.**, 220 Oregon St., Milwaukee, Wis.**MORRISON BROS.**, Dubuque, Ia., p. 495**Munroe & Sons, R.**, 23rd & Smallman Sts., Pittsburgh, Pa.**Muskegon Boiler Works**, Muskegon, Mich.**New Haven Boiler Works**, Mill St., New Haven, Conn.**New York Central Iron Works Co.**, Box 66, Hagerstown, Md.**O'Brien Boiler Works Co.**, John, St. Louis, Mo.**Ohio Machine & Boiler Co.**, 1503 University St., Cleveland, O.**Pennsylvania Boiler Works**, 12th & Penna. Ave., Erie, Pa.**Petroleum Iron Works Co.**, Sharon, Pa.**PHOENIX IRON WORKS CO.**, Meadville, Pa., p. 407**Pickham Boiler Co.**, 3035 W. Jackson Blvd., Chicago, Ill.**Pyne Co.**, 927 Rupp St., Louisville, Ky.**Reliance Boiler Works**, 160 Marion St., Oshkosh, Wis.**Richmond Engineering Co.**, 12 S. 8th St., Richmond, Va.**Ruemmel-Dawley Mfg. Co.**, 3900 Chouteau Ave., St. Louis, Mo.***SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa., pp. 103, 498**Sharpville Boiler Works Co.**, Sharpville, Pa.***SPRINGFIELD BOILER CO.**, Springfield, Ill., p. 60**Star Boiler Works**, Clinton, Ia.**Turl Iron & Car Co., Inc.**, 50 Broad St., New York**UNIFLOW BOILER CO., INC.**, Philadelphia, Pa., p. 62**Union Boiler & Mfg. Co.**, Lebanon, Pa.**UNION IRON WORKS**, Erie, Pa., p. 61**VOGT MACHINE CO.**, HENRY, Louisville, Ky., p. 63**WALSH & WIDENER BOILER CO.**, Chattanooga, Tenn., p. 64**Walton & Son, C. J.**, 1221 W. Main St., Louisville, Ky.**WASHBURN & GRANGER**, 50 Church St., New York., p. 91**Western Drop Forge Co.**, Marion, Ind.**Wholey Boiler Works**, Providence, R. I.**Wilson Steam Boiler Co.**, 1919-27 S. 20th St., Omaha, Nebr.**Wm. Bros. Boiler & Mfg. Co.**, Minneapolis, Minn.**STAMPINGS, SHEET METAL****AKRON METALLIC GASKET CO.**, 152 N. Union St., Akron, O., p. 177**AMERICAN PULLEY CO.**, 4200 Wissahickon Ave., Philadelphia, Pa., p. 200**American Tube & Stamping Co.**, Bridgeport, Conn.**Barnes Co.**, Wallace, Main St., Bristol, Conn.**BOSSERT CORP'N**, Utica, N. Y., p. 304**Boston Pressed Metal Co.**, 175 Union St., Worcester, Mass.**Bridgeport Brass Co.**, Bridgeport, Conn.**Bridgeport Metal Goods Mfg. Co.**, Cherry St., Bridgeport, Conn.**Bristol Brass Co.**, Bristol, Conn.**Cleveland Metal Products Co.**, 7609 Platt Ave., Cleveland, O.**Cleveland Wrought Products Co.**, Cleveland, O.**Coleman Fare Box Co.**, 1191 Bathurst St., Toronto, Canada**Craig Mfg. Co.**, Cedar Rapids, Iowa**Cuyahoga Spring Co.**, Waterloo Road, Cleveland, O.**Detroit Pressed Steel Co.**, Detroit, Mich.**Gasket Supply Co.**, 1708 Ludlow St., Philadelphia, Pa.**Gem Mfg. Co.**, 1229-43 Goebel St., N. S., Pittsburgh, Pa.**Gem Stopper Co.**, 2120 Nicholas St., Philadelphia, Pa.**Geuder, Paeschke & Frey Co.**, 1351 St. Paul Ave., Milwaukee, Wis.**Globe Machine & Stamping Co.**, 1254 W. 76th St., N. W., Cleveland, O.**Great Western Mfg. Co.**, Laporte, Ind.**Lansing Stamping & Tool Co.**, Lansing, Mich.**McCORD MFG. CO.**, Detroit, Mich., p. 169**McKinney Mfg. Co.**, Pittsburgh, Pa.**Mason Machine Co.**, Inc., Jos. M., 2305 N. Marshall St., Philadelphia, Pa.**Matthews Mfg. Co.**, 104 Gold St., Worcester, Mass.**Miller Wire Spring Co.**, Bridgeport, Conn.**Mossberg Co.**, Frank, Attleboro, Mass.**Owen & Co., E. H.**, 101 N. Jefferson St., Chicago, Ill.**Parish Mfg. Co.**, 7th & Chestnut Sts., Reading, Pa.**Ramsdell Specialty Co.**, W. Boyleston St., Worcester, Mass.**Robbins, Gamwell & Co.**, Pittsfield, Mass.**Robinson Tool Works, Inc.**, Waterbury, Conn.**Rockwood Sprinkler Co. of Mass.**, 34-56 Harlow St., Worcester, Mass.**Root Co.**, C. J., Bristol, Conn.**Transue & Williams Steel & Forging Corp'n**, Alliance, O.**WORCESTER PRESSED STEEL CO.**, Worcester, Mass., p. 305**Worcester Stamped Metal Co.**, 9 Hunt St., Worcester, Mass.**Zenite Metal Co.**, Indianapolis, Ind.**STAMPS AND DIES, STEEL****HOGGSON & PETTIS MFG. CO.**, New Haven, Conn., pp. 394, 395, 396**Matthews & Co.**, Jas H., 3942 Forbes St., Pittsburgh, Pa.**NOBLE & WESTBROOK MFG. CO.**, Hartford, Conn., p. 368**Pannier Bros. Stamp Co.**, 207-209 Sandusky St., Pittsburgh, Pa.

STANDPIPES

*CASEY-HEDGES CO., Chattanooga, Tenn...
pp. 42, 43

COLE MFG. CO., R. D., Newnan, Ga... p. 41
PITTSBURGH VALVE, FOUNDRY &
CONST. CO. (Gulland), Pittsburgh, Pa... pp.
132, 133

Sheffield Car Co., Three Rivers, Mich.
WALSH & WEIDNER BOILER CO., Chatta-
nooga, Tenn... p. 64

—Concrete

Heine Chimney Co., 123 W. Madison St., Chi-
cago, Ill.

STARCH MAKING MACHINERY

Remmers & Sons, B., 1227 Germantown Ave.,
Philadelphia, Pa.

STAYBOLTS

Falls Hollow Staybolt Co., 21 E. Portage St.,
Cuyahoga Falls, O.

Flannery Bolt Co., Vanadium Bldg., Pittsburgh,
Pa.

STEAM ENGINES, SEPARATORS, SHOVELS, TRAPS, ETC.

(See Engines, Separators, Shovels, Traps, etc.,
Steam)

STEAM JETS (Smoke Preventers)

KROESCHELL BROS. CO., 460 West Erie St.,
Chicago, Ill... p. 56

STEAM SHOVEL PARTS

American Manganese Steel Co., 1850 McCormick Bldg., Chicago, Ill.

STEAM SPECIALTIES

*AMERICAN DISTRICT STEAM CO., North
Tonawanda, N. Y... p. 140

AMERICAN INJECTOR CO., Detroit, Mich.
p. 151

Burrows Mfg. Co., 41-43 N. Water St., York, Pa.
D'ESTE CO., JULIAN, 26 Canal St., Boston,
Mass... p. 144

Griscom-Russell Co., 90 West St., New York
Hennebelle Co., F., 81st St. & S. Chicago Ave.,
S Chicago, Ill.

Illinois Engineering Co., Racine at 21st St.,
Chicago, Ill.

*JOHNS-MANVILLE CO., H. W., 296 Madison
Ave., New York... p. 162

KIELEY & MUELLER, INC., 34 W. 13th St.,
New York... p. 146

LESLIE CO., Lyndhurst, N. J... p. 147

Mechanical Scale Prevention Co., 65 Dey St.,
New York

Morehead Mfg. Co., Detroit, Mich.

Nightingale & Childs Co., 205 Congress St., Boston,
Mass.

Open Coil Heater & Purifier Co., Indianapolis,
Ind.

PENBERTHY INJECTOR CO., Detroit, Mich.
p. 152, 153

Ross Valve Mfg. Co., Troy, N. Y.

ROTO CO., Hartford, Conn... p. 71

SIMMONS CO., JOHN, 110 Center St., New
York... p. 515

Standard Steam Specialty Co. (Utility), 542 West
Broadway, New York

Sterling Products Co., Inc., Harvard Sq., Cambridge,
Mass.

Watson & McDaniel Co., 142 N. 7th St., Philadelphia,
Pa.

Wilcox Mfg. Co., E. A., Chicago, Ill.

WILFERT CO., JOHN, 258 Broadway, New
York... pp. 136, 137

STEEL**—Alloy**

Atlas Crucible Steel Co., Dunkirk, N. Y.

Becker Steel Co. of America, Inc., 154 Nassau
St., New York

Carbon Steel Co., P. O. Box 1591, Pittsburgh, Pa.

Carpenter Steel Co., Reading, Pa.

Colonial Steel Co., 324 4th Ave., Pittsburgh, Pa.

Denman & Davis, 93-99 Lafayette St., New York

Halcomb Steel Co., Syracuse, N. Y.

Hess Steel Corp'n, East Ave. & P. R. R., Baltimore,
Md.

Ludlum Steel Co., 2 Rector St., New York

Midvale Steel & Ordnance Co., Widener Bldg.,
Philadelphia, Pa.

Swedish Iron & Steel Corp'n, 12 Platt St., New
York

Tacony Steel Co., Tacony, Philadelphia, Pa.

Tungsten Products Co. of Maryland, Baltimore,
Md.

United Alloy Steel Corp'n, Canton, O.

WHEELLOCK, LOVEJOY & CO., 23 Cliff St.,
New York... p. 301

—Alloy (Cold Drawn)

Lancaster Steel Products Co., Lancaster, Pa.

Pittsburgh Tool Steel Wire Co., Monaca, Pa.

*UNION DRAWN STEEL CO., Beaver Falls,
Pa... p. 300

—Chrome

Jessop & Sons, Inc., Wm., 91 John St., New York

—Chrome Nickel

Andrews Steel Co., Newport, Ky.

Jessop & Sons, Inc., Wm., 91 John St., New York

Lindenberg Steel Co., 90 West St., New York

*UNION DRAWN STEEL CO., Beaver Falls,
Pa... p. 300

—Chrome Vanadium

Lindenberg Steel Co., 90 West St., New York

*UNION DRAWN STEEL CO., Beaver Falls,
Pa... p. 300

Union Steel Casting Co., Pittsburgh, Pa.

—Cold Drawn

Compressed Steel Shifting Co., 393 Dorchester
Ave., Boston, Mass.

Dickey Steel Co., Inc., 233 Broadway, New York

Fitzsimmons Co., Youngstown, O.

Moltrup Steel Products Co., Beaver Falls, Pa.

Standard Gauge Steel Co., Beaver Falls, Pa.

*UNION DRAWN STEEL CO., Beaver Falls,
Pa... p. 300

WORCESTER PRESSED STEEL CO., Worcester,
Mass... p. 305

—Cold Rolled

Athenia Steel Co., 135 William St., New York

Barnes Co., Wallace, Main St., Bristol, Conn.

Carpenter Steel Co., Reading, Pa.

Denman & Davis, 93-99 Lafayette St., New York

Jessop & Sons, Inc., Wm., 91 John St., New York

*UNION DRAWN STEEL CO., Beaver Falls,
Pa... p. 300

—Crucible

Atlas Crucible Steel Co., Dunkirk, N. Y.

Braeburn Steel Co., Braeburn, Pa.

Century Steel Co. of America, 120 Broadway,
New York

Cyclops Steel Co., 120 Broadway, New York

Denman & Davis, 93-99 Lafayette St., New York

Jessop & Sons, Inc., Wm., 91 John St., New York

Ludlum Steel Co., 2 Rector St., New York

McInnes Steel Co., Ltd., Corry, Pa.

Pollock Steel Co., Cincinnati, O.

—Crucible (Cold Drawn)

*UNION DRAWN STEEL CO., Beaver Falls,
Pa... p. 300

—Electric Furnace

Braeburn Steel Co., Braeburn, Pa.

Crowley Co., John A., 120 Liberty St., New York

Electro Steel Co., Inc., Curry Bldg., Pittsburgh,
Pa.

Hess Steel Corp'n, East Ave. & P. R. R., Baltimore,
Md.

*UNION DRAWN STEEL CO., Beaver Falls,
Pa... p. 300

United Alloy Steel Corp'n, Canton, O.

—File

Jessop & Sons, Inc., Wm., 91 John St., New York

—High Speed

Allen & Co., Ltd., Edgar, 718-22 West Lake St.,
Chicago, Ill.

Andrew & Co., Ltd., Kno. Hy., 26 Cortlandt St.,
New York

Apex Steel Corp'n, 50 Church St., New York

Atlas Crucible Steel Co., Dunkirk, N. Y.

Becker Steel Co. of America, Inc., 154 Nassau
St., New York

Ste

STEEL (Continued)**—High Speed**

Century Steel Co. of America, 120 Broadway, New York
 Colonial Steel Co., 324 4th Ave., Pittsburgh, Pa.
 Columbia Tool Steel Co. (Clarite), Chicago Heights, Ill.

Cyclops Steel Co., 120 Broadway, New York
 Dickey Steel Co., Inc., 233 Broadway, New York
 Firth-Sterling Steel Co., McKeesport, Pa.
 Halcomb Steel Co., Syracuse, N. Y.
 Haring, Ellsworth, 114 Liberty St., New York
 Haynes Stellite Co., Kokomo, Ind.
 Hobson, Houghton & Co., Ltd., 83 Beekman St., New York

Jessop & Sons, Inc., Wm., 91 John St., New York
 Lindenberg Steel Co., 90 West St., New York
 McInnes Steel Co., Ltd., Corry, Pa.
 Metro Steel Co., Wabash Bldg., Pittsburgh, Pa.
 Vanadium Alloys Steel Co., Latrobe, Pa.
WHEELOCK, LOVEJOY & CO., 23 Cliff St., New York... *p. 301*

—Magnet

Atlas Crucible Steel Co., Dunkirk, N. Y.
 Lindenberg Steel Co., 90 West St., New York
WHEELOCK, LOVEJOY & CO., 23 Cliff St., New York... *p. 301*

—Manganese

American Manganese Steel Co., 1850 McCormick Bldg., Chicago, Ill.
 Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

—Nickel

Andrew & Co., Ltd., Jno. Hy., 26 Cortlandt St., New York
 Jessop & Sons, Inc., Wm., 91 John St., New York
 Lindenberg Steel Co., 90 West St., New York

—Open Hearth

Atlas Steel Casting Co., 1963 Elmwood Ave., Buffalo, N. Y.
 Braddock Mfg. Co., Braddock, Pa.
FALK CO., Milwaukee, Wis., *pp. 188, 189*
 Jones & Laughlin Steel Co., 3rd Ave. & Ry., Pittsburgh, Pa.
LUKENS STEEL CO., Coatesville, Pa., *p. 60*
 Pittsburgh Steel Co., Union Arcade Bldg., Pittsburgh, Pa.

United Alloy Steel Corp'n, Canton, O.
WHEELOCK, LOVEJOY & CO., 23 Cliff St., New York... *p. 301*
 Wood, Iron & Steel Co., Alan, Widener Bldg., Philadelphia, Pa.

—Open Hearth (Cold Drawn)

Columbia Steel & Shifting Co., Pittsburgh, Pa.
 Compressed Steel Shifting Co., 393 Dorchester Ave., Boston, Mass.

***UNION DRAWN STEEL CO.**, Beaver Falls, Pa., *p. 300*

—Rock Drill

International High Speed Steel Co., 99 Nassau St., New York

—Self Hardening

Jessop & Sons, Inc., Wm., 91 John St., New York

—Shim

Barnes Co., Wallace, Main St., Bristol, Conn.

—Spring

Athenia Steel Co., 135 William St., New York
 Haring, Ellsworth, 114 Liberty St., New York
 Jessop & Sons, Inc., Wm., 91 John St., New York

—Stellite

Haynes Stellite Co., Kokomo, Ind.

—Strip

American Tube & Stamping Co., Bridgeport, Conn.
 Barnes Co., Wallace, Main St., Bristol, Conn.
 Central Steel & Wire Co., 119 N. Peoria St., Chicago, Ill.
 Haring, Ellsworth, 114 Liberty St., New York
 Jessop & Sons, Inc., Wm., 91 John St., New York
WORCESTER PREPRESSED STEEL CO., Worcester, Mass., *p. 305*

—Strip (Hot Rolled)

American Tube & Stamping Co., Bridgeport, Conn.

—Strip (Tempered and Blued)

Barnes Co., Wallace, Main St., Bristol, Conn.

—Structural

BLAW-KNOX CO., Pittsburgh, Pa., *p. 489*
 Cincinnati Iron & Steel Co., Cincinnati, O.
 Continental Bridge Co., Peotone, Ill.
 Illinois Steel Co., 208 S. LaSalle St., Chicago, Ill.
 Just Co., Geo. A., 239 Vernon Ave., Long Island City, N. Y.

—Tool

Allen & Co., Ltd., Edgar, 718-22 West Lake St., Chicago, Ill.
 Andrew & Co., Ltd., Jno. Hy., 26 Cortlandt St., New York

Apex Steel Corp'n, 50 Church St., New York
 Atlas Crucible Steel Co., Dunkirk, N. Y.
 Becker Steel Co. of America, Inc., 154 Nassau St., New York

Carpenter Steel Co., Reading, Pa.
 Century Steel Co. of America, 120 Broadway, New York

Colonial Steel Co., 324 4th Ave., Pittsburgh, Pa.
 Columbia Tool Steel Co. (Columbia), Chicago Heights, Ill.

Cyclops Steel Co., 120 Broadway, New York
 Dickey Steel Co., Inc., 233 Broadway, New York
 Firth-Sterling Steel Co., McKeesport, Pa.

Halcomb Steel Co., Syracuse, N. Y.
 Haynes Stellite Co., Kokomo, Ind.
 Hess Steel Corp'n, East Ave. & P. R. R., Baltimore, Md.

Hobson, Houghton & Co., Ltd., 83 Beekman St., New York

International High Speed Steel Co., 99 Nassau St., New York

Jessop & Sons, Inc., Wm., 91 John St., New York
 Lindenberg Steel Co., 90 West St., New York
 Metro Steel Co., Wabash Bldg., Pittsburgh, Pa.
 Pittsburgh Tool Steel Wire Co., Monaca, Pa.
RYERSON & SON, JOSEPH T., 16th & Rockwell Sts., Chicago, Ill., *p. 366*

Swedish Iron & Steel Corp'n, 12 Platt St., New York

WHEELOCK, LOVEJOY & CO., 23 Cliff St., New York... *p. 301*

—Vanadium

Union Steel Casting Co., Pittsburgh, Pa.

STEEL BARS, BILLETS, BLOOMS, DISCS, SLABS, SHEETS, ETC.
 (See Bars, Billets, Blooms, Discs, Slabs, Sheets, etc., Steel)

STEEL PLATE CONSTRUCTION

Bass Foundry & Machine Co., Fort Wayne, Ind., *p. 35*

***BIGELOW CO.**, 76 River St., New Haven, Conn., *p. 40*

Birmingham Boiler Works, Birmingham, Ala.

BLAW-KNOX CO., Pittsburgh, Pa., *p. 489*

Brennan & Co., John, 24th St. & M. C. R. R., Detroit, Mich.

Burhorn Co., Edwin, 71 Wall St., New York

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky., *p. 201*

Carroll-Porter Boiler & Tank Co., Pittsburgh, Pa.

Coatesville Boiler Works, 30 Church St., New York

COLE MFG. CO., R. D., Newnan, Ga., *p. 41*

Connery & Co., Inc., 2nd & Luzerne Sts., Philadelphia, Pa.

Cunningham Co., Christopher, Greenpoint Ave. & Newton Creek, Brooklyn, N. Y.

DILLON STEAM BOILER WORKS. D. M. Fitchburg, Mass., *pp. 44, 45*

Dover Boiler Works, 50 Church St., New York

Enterprise Boiler Co., Youngstown, O.

FROST MFG. CO., 112 W. Adams St., Chicago, Ill., *pp. 47, 462*

Gerdes Co., Inc., 30 Church St., New York

Gillespie Mfg. Co. Corp'n, 12th & Monmouth Sts., Jersey City, N. J.

Advertisements of firms marked * appear in The Journal, A. S. M. E.

Graver Tank Works, Wm., 28 E. Jackson Blvd., Chicago, Ill.
 Hammond Iron Works, Warren, Pa.
 *HEINE SAFETY BOILER CO., St. Louis, Mo. . . p. 50
 Hodge Boiler Works, 99 Sumner St., East Boston, Mass.
 HOLMES & BROS., ROBT., Danville, Ill. . . p. 270
 Johnson & Barry Steel Co., Inc., Birmingham, Ala.
 KEELER CO., E., Williamsport, Pa. . . p. 51
 Kittoe Boiler & Tank Co., Inc., Canton, O.
 KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . p. 494
 Lancaster Iron Works, Inc., Lancaster, Pa.
 Lookout Boiler & Mfg. Co., Chattanooga, Tenn.
 MARK MFG. CO., P. O. Box G, Chicago, Ill. . . p. 160
 McAleenan Bros. Co., 25th & R.R. Sts., Pittsburgh, Pa.
 McClintic-Marshall Co., 1217 Oliver Bldg., Pittsburgh, Pa.
 McNeil & Bro. Co., James, 29th St. & A.V.R.R., Pittsburgh, Pa.
 Meehan Boiler & Construction Co., Lowellville, Ohio
 Milwaukee Boiler Co., 220 Oregon St., Milwaukee, Wis.
 MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis. . . p. 112
 Mohr & Sons, John, 349-359 W. Illinois St., Chicago, Ill.
 Munroe & Sons, R., 23rd & Smallman Sts., Pittsburgh, Pa.
 Muskegon Boiler Works, Muskegon, Mich.
 New Haven Boiler Works, Mill St., New Haven, Conn.
 New York Central Iron Works Co., Box 66, Hagerstown, Md.
 Nichols Iron Works, Inc., D. M., 2-4 Governor Slip, New York
 Ohio Machine & Boiler Co., 1503 University St., Cleveland, O.
 Petroleum Iron Works Co., Sharon, Pa.
 PHOENIX IRON WORKS CO., Meadville, Pa. . . p. 497
 Pickham Boiler Co., 3035 W. Jackson Blvd., Chicago, Ill.
 Pollock Co., Wm. B., Youngstown, O.
 Prospect Boiler Co., Codrue Ave. & Power St., New Brunswick, N. J.
 Riter-Conley Co., Pittsburgh, Pa.
 Ruemml-Dawley Mfg. Co., 3900 Chouteau Ave., St. Louis, Mo.
 Sharpsville Boiler Works Co., Sharpsville, Pa.
 Smith & Son Co., Samuel, 130-150 Railroad Ave., Paterson, N. J.
 Standard Boiler & Plate Iron Co., Niles, O.
 Struthers-Wells Co., Warren, Pa.
 Treadwell Const. Co., Midland, Pa.
 Turl Iron & Car Co., Inc., 50 Broad St., New York
 Union Boiler & Mfg. Co., Lebanon, Pa.
 UNION IRON WORKS, Erie, Pa. . . p. 61
 WALSH & WEIDNER BOILER CO., Chattanooga, Tenn. . . p. 64
 Walsh's Holyoke Steam Boiler Works, Holyoke, Mass.
STEEL TEMPERING (Refrigeration)
 Phoenix Ice Machine Co., 2711 Church St., Cleveland, O.
STEEL TESTING APPARATUS
 BROWN INSTRUMENT CO., Philadelphia, Pa. . . p. 531
 Holz, Herman A., 1 Madison Ave., New York
STEEL TREATING
 CONNECTICUT METAL TREATING CO., INC., 207 Knowlton St., Bridgeport, Conn.
 WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y. . . p. 397
STEEL WORKS EQUIPMENT
 Blair Engineering Co., 17 Battery Place, New York

Industrial Electric Furnace Co., 1405 Monadnock Bldg., Chicago, Ill.
 Morgan Engineering Co., Alliance, O.
 Reliance Steel Casting Co., 28th & Smallman Sts., Pittsburgh, Pa.
 United Engineering & Foundry Co., Farmers Bank Bldg., Pittsburgh, Pa.
STEPPLE TOWERS (Coal)
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill. . . p. 256
 Maine Electric Co., 35 Commercial St., Portland, Me.
STEERING GEARS
 —Automobile
 Lavine Gear Co., Racine, Wis.
 VAN DORN & DUTTON CO., Cleveland, O. . . p. 370
 Warner Gear Co., Muncie, Ind.
 —Steam (Marine)
 Johnson Co., Wm. T., Cincinnati, O.
 —Tractor
 Lavine Gear Co., Racine, Wis.
STERILIZERS
 Clow & Sons, James B., Chicago, Ill.
 KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . p. 494
STILLS
 —Tar
 KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . p. 494
 MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. . . p. 496
 —Water
 *CASEY-HEDGES CO., Chattanooga, Tenn. . . pp. 42, 43
 *HODGES WATER STILL CO., INC., 1234 Callowhill St., Philadelphia, Pa. . . p. 500
 KEELER CO., E., Williamsport, Pa. . . p. 51
 KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . p. 494
 McAleenan Bros. Co., 25th & R. R. Sts., Pittsburgh, Pa.
 Standard Water Systems Co., Hampton, N. J.
 —Welded
 American Welding Co., Carbondale, Pa.
 Kellogg Co. M. W., 90 West St., New York
STOCKS AND DIES
 Bay State Tap & Die Co., Mansfield, Mass.
 Borden Co. (Beaver), Warren, O.
 Carpenter, Tap & Die Co., J. M., Pawtucket, R. I.
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill. . . pp. 120, 121, 122, 123
 *GREENFIELD TAP & DIE CORP'N, Greenfield, Mass. . . pp. 374, 375
 Hart Mfg. Co., 2315 E. 20th St., Cleveland, O.
 LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373
 MARK MFG. CO., P. O. Box G, Chicago, Ill. . . p. 160
 Pottstown Machine Co., Pottstown, Pa.
 PRATT & WHITNEY CO., 111 Broadway, New York. . . p. 344
 Reed Mfg. Co., Erie, Pa.
 Threading Machine Co., Sandusky, O.
 Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo, O.
STOKERS
 —Chain Grate
 AUTOMATIC FURNACE CO., Dayton, O. . . p. 78
 *BABCOCK & WILCOX CO., 85 Liberty St., New York. . . pp. 36, 37, 38, 39
 Babcock & Wilcox, Ltd., College St., St. Henry, Montreal, Canada
 Birch, Riley & Co., 41 Cortlandt St., New York
 Brady Foundry Co., James A., 45th St. & Western Blvd., Chicago, Ill.
 Crowe, Paul L., 33 Bidwell Ave., Jersey City, N. J.
 *GREEN ENGINEERING CO., 13 Kennedy Ave., East Chicago, Ind. . . pp. 80, 81
 Illinois Stoker Co., Alton, Ill.
 Keystone Stoker Co., Greenfield, Mass.

Sto

See Catalogue Section for data of firms listed in capital type

STOKERS (Continued)
—Chain Grate

Laclede-Christy Clay Products Co., 1673 Ry. Exchange Bldg., St. Louis, Mo.
Manistee Iron Works Co., Manistee, Mich.
Rosedale Foundry & Machine Co., Columbus & Preble Aves., Pittsburgh, Pa.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

—Hand Operated

Cokal Stoker Co., Chicago, Ill.
FLYNN & EMRICH CO., Baltimore, Md... p. 85
Hofft Co., M. A., Indianapolis, Ind.

—Locomotive

*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York... p. 93
Locomotive Stoker Co., Robinson & Darrah Sts., Northside, Pittsburgh, Pa.
Standard Stoker Co., Grand Central Terminal, New York

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... pp. 466, 467

—Overfeed

AUTOMATIC FURNACE CO., Dayton O... p. 78

Burke Furnace Co., Chicago, Ill.
*CASEY-HEDGES CO., Chattanooga, Tenn... pp. 42, 43

Cokal Stoker Co., Chicago, Ill.
DETROIT STOKER CO., Detroit, Mich... p. 79
Lehigh Stoker Co., Fullerton, Pa.
McCLAVE-BROOKS CO. (McClave's), Scranton, Pa... p. 87

McKenzie Furnace Co., 647 McCormick Bldg., Chicago, Ill.

*MURPHY IRON WORKS, Detroit, Mich... pp. 82, 83

Roach & Co., Inc., Joseph H., 139 S. 15th St., Philadelphia, Pa.

Swift Stoker Co., Railway Exchange Bldg., Chicago, Ill.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115
Wetzel Mechanical Stoker Co. of New York, Inc., 30 Church St., New York
Woolson, Orosco C., 30 Cortland St., New York

—Overfeed (Anthracite)
DETROIT STOKER CO., Detroit, Mich... p. 79

Lehigh Stoker Co., Fullerton, Pa.

McCLAVE-BROOKS CO. (McClave's), Scranton, Pa... p. 87

Roach & Co., Inc., Joseph H., 139 S. 15th St., Philadelphia, Pa.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

—Powdered Fuel

*FULLER-LEHIGH CO., Fullerton, Pa... p. 92

*LOCOMOTIVE PULVERIZED FUEL CO., 30 Church St., New York... p. 93

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... pp. 466, 467

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

—Traveling Grate (Anthracite)

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

—Underfeed

American Engineering Co., Philadelphia, Pa.
Combustion Engineering Corp., 11 Broadway, New York

Kokomo Foundry & Machine Co., Kokomo, Ind.
Moloch Stoker Co., Room 776, 208 S. LaSalle St., Chicago, Ill.

NELSON BLOWER & FURNACE CO., 11 Elkins St., Boston, Mass... p. 67

*RILEY STOKER CO., LTD., SANFORD, Worcester, Mass... p. 84

Roach & Co., Inc., Joseph H., 139 S. 15th St., Philadelphia, Pa.

Underfeed Stoker Co. of America (Jones), 111 W. Monroe St., Chicago, Ill.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

STONE WORKING MACHINERY
Lincoln Iron Works, 255 West St., Rutland, Vt.

STONES, SHARPENING
CARBORUNDUM CO., Niagara Falls, N. Y... p. 389

Cleveland Stone Co., Cleveland, O.

NORTON CO., Worcester, Mass... p. 391

Superior Corundum Wheel Co., Waltham, Mass.

STOPPER HEADS

—Graphite
McCullough-Dalzell Crucible Co., 36th St., Pittsburgh, Pa.

Seidel, Inc., R. B., 1322 Callowhill St., Philadelphia, Pa.

—Plumbago
Ross-Tacony Crucible Co., Tacony, Pa.

STRAINERS
—Oil

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... p. 140

ANTHONY CO., 138 West Ave., Long Island City, N. Y... p. 410

HAMMEL OIL BURNING EQUIPMENT CO., 409 Pine St., Providence, R. I... p. 95

KRAUSE, A. E., Mountain Lakes, N. J... p. 111

Lockett & Co., Ltd., A. M., New Orleans, La.

Plouf Co., 1500 River St., Boston, Mass.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... pp. 170, 171

Self Cleaning Strainer Co., 6329 Stewart Ave., Chicago, Ill.

—Steam

KIELEY & MUELLER, INC., 34 W. 13th St., New York... p. 146

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... pp. 132, 133

Self Cleaning Strainer Co., 6329 Stewart Ave., Chicago, Ill.

—Water

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... p. 140

Elliott Co., Frick Bldg., Pittsburgh, Pa.

KIELEY & MUELLER, INC., 34 W. 13th St., New York... p. 146

MARK MFG. CO., P. O. Box G, Chicago, Ill... p. 160

Rosedale Foundry & Machine Co., Columbus & Preble Aves., Pittsburgh, Pa.

Self Cleaning Strainer Co., 6329 Stewart Ave., Chicago, Ill.

—Water (Traveling)

*CHAIN BELT CO., 735 Park St., Milwaukee, Wis... pp. 118, 119

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... p. 256

STRAINING MACHINES, RUBBER

Royle & Sons, John, Paterson, N. J.

STRUCTURAL STEEL WORK

American Bridge Co., 30 Church St., New York

Beach Mfg. Co., Charlotte, Mich.

Birmingham Boiler Works, Birmingham, Ala.

BLAW-KNOX CO., Pittsburgh, Pa... p. 489

Bolles Iron & Wire Works, J. E., 53 Porter St., Detroit, Mich.

Bridgeport Boiler Works Co., Bridgeport, Conn.

Dominion Bridge Co., Ltd., Montreal, P. Q., Canada

Gifford-Wood Co., Hudson, N. Y.

Guarantee Construction Co., 90 West St., New York

Hendrick Mfg. Co., Carbondale, Pa.

Johnson & Barry Steel Co., Inc., Birmingham, Ala.

McClintic-Marshall Co., 1217 Oliver Bldg., Pittsburgh, Pa.

McDougall & Potter Co., 606-612 W. 55th St., New York

Michelmann Steel Construction Co., 121-141 N. Second St., Quincy, Ill.

Phoenix Iron Co., 410 Walnut St., Philadelphia, Pa.
 Pyne Co., 927 Rupp St., Louisville, Ky.
 Red Wing Iron Works, Red Wing, Minn.
 Russel Wheel & Foundry Co., Detroit, Mich.
 *SCAIFE & SONS CO., W.M. B., Pittsburgh, Pa... pp. 103, 498
 Schreiber & Sons Co., L., P. O. Box 18, Evanston Sta., Cincinnati, O.
 United Iron Works Co., Kansas City, Mo.
 Vulcan Iron Works, 1849 Kearny St., San Francisco, Cal.
 WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... p. 64
 Walsh's Holyoke Steam Boiler Works, Holyoke, Mass.
 Whitehead & Kales Iron Works, Beecher Ave. & M. C. R. R., Detroit, Mich.
STUD SETTERS (Opening)
 Errington Mechanical Laboratory, 39 Cortlandt St., New York

STUDS

(See Bolts, Stud)

SUGAR MACHINERY

Bartlett Hayward Co., Baltimore, Md.
 *CASEY-HEDGES CO., Chattanooga, Tenn... pp. 42, 43
 Catton-Neill & Co., Ltd., Honolulu, T. H.
 Cresson-Morris Co., 18th St. & Allegheny Ave., Philadelphia, Pa.
 DuVivier, Ernest H., 30 Church St., New York
 Hersey Mfg. Co., South Boston, Mass.
 Kilby Mfg. Co., Cleveland, O.
 PHOENIX IRON WORKS CO., Meadville, Pa... p. 497
 Pratt Engineering & Machine Co., Atlanta, Ga.
 Squier Mfg. Co., Geo. L., Buffalo, N. Y.
 Steacy-Schmidt Mfg. Co., 230 E. Hay St., York, Pa.
 Treadwell Co., M. H., 140 Cedar St., New York
 Turl Iron & Car Co., Inc., 50 Broad St., New York
 WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... p. 64
 WOOD & CO., R. D., Philadelphia, Pa... p. 458
—Best
 Dyer Co., 2031 Euclid Ave., Cleveland, O.
 Kilby Mfg. Co., Cleveland, O.
 MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... p. 496
 Stearns-Roger Mfg. Co., 1718-1720 California St., Denver, Colo.
 STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... pp. 466, 467
 SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill... p. 501

—Cane

Birmingham Machine & Foundry Co., Birmingham, Ala.
 Dyer Co., 2031 Euclid Ave., Cleveland, O.
 Farrel Foundry & Machine Co., Ansonia, Conn.
 FULTON IRON WORKS CO., St. Louis, Mo... p. 24
 Honolulu Iron Works Co., Honolulu, T. H.

SUPERHEATERS, STEAM

*BABCOCK & WILCOX CO., 85 Liberty St., New York... pp. 36, 37, 38, 39
 Babcock & Wilcox, Ltd., College St., St. Henry, Montreal, Canada
 Dravo Co., 1197 30th St., Milwaukee, Wis.
 *HEINE SAFETY BOILER CO., St. Louis, Mo... p. 50
 Power Specialty Co. (Foster), 111 Broadway, New York
 Superheater & Engineering Co., 1812-14 Woolworth Bldg., New York
 UNIFLOW BOILER CO., INC., Philadelphia, Pa... p. 62

—Locomotive

Locomotive Superheater Co., 30 Church St., New York
 Power Specialty Co., 111 Broadway, New York

—Marine

*BABCOCK & WILCOX CO., 85 Liberty St., New York... pp. 36, 37, 38, 39
 Locomotive Superheater Co., 30 Church St., New York
 Power Specialty Co., 111 Broadway, New York
SWAGING MACHINES
 Torrington Co. (Dayton), Torrington, Conn.
SWITCH STANDS
 Bethlehem Steel Co., South Bethlehem, Pa.
SWITCHBOARDS
 Carleton-Mace Engine Corp'n, 38 Chardon St., Boston, Mass.
 Condit Electrical Mfg. Co., 838 Summer St., South Boston, Mass.
 Frost Engineering Co., Evansville, Wis.
 *GENERAL ELECTRIC CO., Schenectady, N. Y... pp. 20, 21, 521
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

SWITCHES**—Electric**

Condit Electrical Mfg. Co., 838 Summer St., South Boston, Mass.
 *GENERAL ELECTRIC CO., Schenectady, N. Y... pp. 20, 21, 521
 Ives Mfg. Co., Baltimore, Md.
 *WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

—Float

Chicago Automatic Switch Co., 212 N. Peoria St., Chicago, Ill.

—Overhead Tramrail

FARNHAM MFG. CO., 31-39 Indiana St., Buffalo, N. Y... p. 277
 Philadelphia Tramrail Co., Front & Tusculum Sts., Philadelphia, Pa.

—Selective (Pyrometer)

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

SWITCHES AND FROGS

Helmick Foundry & Machine Co., Fairmount, W. Va.
 Weir Frog Co., Cincinnati, O.
 Wharton, Jr., & Co., Inc., Wm., P. O. Box 124, Easton, Pa.

SWIVELS, HOIST HOOK

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... p. 397

SYRUP MACHINERY

FFAUDLER CO., Rochester, N. Y... p. 499
 Red Wing Iron Works, Red Wing, Minn.

T**TACHOMETERS**

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa... p. 539
 BRISTOL CO., Waterbury, Conn... p. 530
 BROWN INSTRUMENT CO., Philadelphia, Pa... p. 531
 CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... p. 527
 Electric Tachometer Co., 710-11 Otis Bldg., Philadelphia, Pa.
 *FOXBORO CO., INC., Foxboro, Mass... p. 533
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... p. 162
 Queen-Gray Co., 616-20 Chestnut St., Philadelphia, Pa.
 *SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y... pp. 534
 Schuchardt & Schutte, 90 West St., New York
 Standard Thermometer Co., 65 Shirley St., Boston, Mass.
 Thompson-Levering Co., 325 Arch St., Philadelphia, Pa.
 Veeder Mfg. Co., 20 Sargent St., Hartford, Conn.

Ttc

TACHOMETERS (Continued)

*WESTON ELECTRICAL INSTRUMENT CO., 49 Weston Ave., Waverly Park, Newark, N. J. . . . p. 537

Wilson-Mauleen Co., 781 E. 142nd St., New York

—**Electro-Magnetic**

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa. . . . p. 539

BROWN INSTRUMENT CO., Philadelphia, Pa. . . . p. 531

—**Vibrating-Reed**

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa. . . . p. 539

TACHOSCOPES

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa. . . . p. 539

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y. . . . p. 534

Schuchardt & Schutte, 90 West St., New York

TACK MAKING MACHINERY

Perkins Co., Henry, Bridgewater, Mass.

TACKLE BLOCKS

(See Blocks, Tackle)

TANKS—**Acid**

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky. . . . p. 201

*CASEY-HEDGES CO., Chattanooga, Tenn. . . . p. 42, 43

COLE MFG. CO., R. D., Newnan, Ga. . . . p. 41

KEELER CO., E., Williamsport, Pa. . . . p. 51

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . . p. 494

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa. . . . p. 496

MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis. . . . p. 112

PFAUDLER CO., Rochester, N. Y. . . . p. 499

UNITED LEAD CO., 111 Broadway, New York. . . . p. 299

WALSH & WEIDNER CO., Chattanooga, Tenn. . . . p. 64

Warren City Tank & Boiler Co., Warren, O.

—**Air Separating**

WEBSTER & CO., WARREN, Camden, N. J. . . . pp. 108, 109, 110

—**Aluminum**

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. . . . p. 294

UNITED LEAD CO., 111 Broadway, New York . . . p. 299

—**Braced**

MORRISON BROS., Dubuque, Ia. . . . p. 495

—**Copper**

BADGER & SONS CO., E. B., Boston, Mass. . . . p. 159

—**Gasoline Storage**

Bowser & Co., Inc., S. F., Ft. Wayne, Ind.

Buckeye Boiler Co., 1617 McLain St., Dayton, O.

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky. . . . p. 201

*CASEY-HEDGES CO., Chattanooga, Tenn. . . . pp. 42, 43

COLE MFG. CO., R. D., Newnan, Ga. . . . p. 41

KEELER CO., E., Williamsport, Pa. . . . p. 51

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . . p. 494

Lord & Burnham Co., 2 Main St., Irvington-on-Hudson, N. Y.

MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis. . . . p. 112

MORRISON BROS., Dubuque, Ia. . . . p. 495

OIL CITY BOILER WORKS, Oil City, Pa. . . . p. 58

*SCAIFE & SONS CO., WM. B., Pittsburgh, Pa. . . . pp. 103, 498

—**Glass Enameled**

PFAUDLER CO., Rochester, N. Y. . . . p. 499

—**Hydro-Pneumatic**

MORRISON BROS., Dubuque, Ia. . . . p. 495

Nagle Engine & Boiler Works, Erie, Pa.

—**Motor Truck and Wagon**

MORRISON BROS., Dubuque, Ia. . . . p. 495

—**Oil**

McAleenan Bros. Co., 25th & R. R. Sts., Pittsburgh, Pa.

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis. . . . pp. 170-171

Turner Oil Filter Co., Niles, Mich.

Wayne Oil Tank & Pump Co., Canal St., Fort Wayne, Ind.

—**Paint and Varnish**

Buckeye Boiler Co., 1617 McLain St., Dayton, O.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . . p. 494

PFAUDLER CO., Rochester, N. Y. . . . p. 499

—**Pressure**

American Welding Co., Carbondale, Pa.

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind. . . . p. 35

*BIGELOW CO., 76 River St., New Haven, Conn. . . . p. 40

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky. . . . p. 201

*CASEY-HEDGES CO., Chattanooga, Tenn. . . . pp. 42, 43

COLE MFG. CO., R. D., Newnan, Ga. . . . p. 41

Farrar & Trefts, Inc., Perry & Illinois Sts., Buffalo, N. Y.

Gem City Boiler Co., Dayton, O.

Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia, Pa.

KEELER CO., E., Williamsport, Pa. . . . p. 51

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . . p. 494

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill.

Leslie & Elliott Co., Cor. E. Railway & Iowa Aves., Paterson, N. J.

Lord & Burnham Co., 2 Main St., Irvington-on-Hudson, N. Y.

Lunt-Moss Co., 43 S. Market St., Boston, Mass.

MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis. . . . p. 112

MORRISON BROS., Dubuque, Ia. . . . p. 495

Nagle Engine & Boiler Works, Erie, Pa.

OIL CITY BOILER WORKS, Oil City, Pa. . . . p. 58

PHOENIX IRON WORKS CO., Meadville, Pa. . . . p. 497

Riverside Boiler Works, Inc., 491 Main St., Cambridgeport, Mass.

Ruemelt-Dawley Mfg. Co., 3900 Chouteau Ave., St. Louis, Mo.

*SCAIFE & SONS CO., WM. B., Pittsburgh, Pa. . . . pp. 103, 498

Stewart Boiler Works, Albany St., Worcester, Mass.

UNIFLOW BOILER CO., INC., Philadelphia, Pa. . . . p. 62

WALSH & WEIDNER BOILER CO., Chattanooga, Tenn. . . . p. 64

WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa. . . . pp. 432, 433

Wood Mfg. Co., John, Conshohocken, Pa.

—**Railroad (Locomotive)**

COLE MFG. CO., R. D., Newnan, Ga. . . . p. 41

—**Septic**

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . . p. 494

MORRISON BROS., Dubuque, Ia. . . . p. 495

—**Sprinkler**

Bath Iron Works, Ltd., Bath, Me.

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky. . . . p. 201

Chicago Bridge & Iron Works, 37 W. Van Buren St., Chicago, Ill.

COLE MFG. CO., R. D., Newnan, Ga. . . . p. 41

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J. . . . p. 494

KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill. . . . p. 50

Schofield's Sons Co., J. S., Macon, Ga.

Tac

—Steel

Abendroth Co., G. Irving, 10 E. 43rd St., New York
 Akerlund & Semmes, 17 Battery Place, New York
 BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind., *p. 35*
 *BIGELOW CO., 76 River St., New Haven, Conn., *p. 40*
 Birmingham Boiler Works, Birmingham, Ala.
 BLAW-KNOX CO. (Knox), Pittsburgh, Pa., *p. 489*
 Brennan & Co., John, 24th St. & M. C. R. R., Detroit, Mich.
 Bridgeport Boiler Works Co., Bridgeport, Conn.
 Bros Boiler & Mfg. Co., Wm. Minneapolis, Minn.
 CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky., *p. 201*
 California Corrugated Culvert Co., West Berkeley, Cal.
 Carroll-Porter Boiler & Tank Co., Pittsburgh, Pa.
 Coatesville Boiler Works, 30 Church St., New York
 Codd Co., E. J., 700-708 S. Caroline St., Baltimore, Md.
 COLE MFG. CO., R. D., Newnan, Ga., *p. 41*
 Connery & Co., Inc., 2nd & Luzerne Sts., Philadelphia, Pa.
 Cunningham Co., Christopher, Greenpoint Ave. & Newton Creek, Brooklyn, N. Y.
 DILLON STEAM BOILER WORKS, D. M., Fitchburg, Mass., *p. 44, 45*
 Dover Boiler Works, 50 Church St., New York
 Enterprise Boiler Co., Youngstown, O.
 Farrar & Trefls, Inc., Perry & Illinois Sts., Buffalo, N. Y.
 FROST MFG. CO., 112 W. Adams St., Chicago, Ill., *p. 47, 462*
 Gillespie Mfg. Corp'n, 12th & Monmouth Sts., Jersey City, N. J.
 Graver Tank Works, Wm., 28 E. Jackson Blvd., Chicago, Ill.
 Grupe Drier & Boiler Co., 325-331 E. Second St., Davenport, Ia.
 Hammond Iron Works, Warren, Pa.
 *HEINE SAFETY BOILER CO., St. Louis, Mo., *p. 50*
 Hodge Boiler Works, 99 Sumner St., East Boston, Mass.
 Honhorst Co., Jos., 1016-20 W. 8th St., Cincinnati, O.
 Kaw Boiler Works Co., Kansas City, Mo.
 KEELER CO., E., Williamsport, Pa., *p. 51*
 Kelly Foundry & Machine Co., E. Purl St., Goshen, Ind.
 Kittoe Boiler & Tank Co., Inc., Canton, O.
 KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J., *p. 404*
 KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill., *p. 56*
 Lebanon Boiler Works, Lebanon, Pa.
 Llewellyn Iron Works, Los Angeles, Cal.
 Lookout Boiler & Mfg. Co., Chattanooga, Tenn.
 Mack Bros. Boiler & Sheet Iron Works, Syracuse, N. Y.
 McAleenan Bros. Co., 25th & R. R. Sts., Pittsburgh, Pa.
 McDermott Engineering Co., Whitehall & Jordan Sts., Allentown, Pa.
 McNaul Boiler Mfg. Co., Toledo, O.
 McNeill & Bro. Co., James, 29th St. & A. V. R. R., Pittsburgh, Pa.
 Meehan Boiler & Construction Co., Lowellville, Ohio
 Michelmann Steel Construction Co., 121-141 Second St., Quincy, Ill.
 MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis., *p. 112*
 MORRISON BROS., Dubuque, Ia., *p. 495*
 Munroe & Sons, R., 23rd & Smallman Sts., Pittsburgh, Pa.
 New Haven Boiler Works, Mill St., New Haven, Conn.
 New York Central Iron Works Co., Box 66, Hagerstown, Md.

Newbold & Son Co., R. S., Norristown, Pa.
 Nichols Iron Works, Inc., D. M., 2-4 Governor Slip, New York
 Ohio Machine & Boiler Co., 1503 University St., Cleveland, O.
 OIL CITY BOILER WORKS, Oil City, Pa., *p. 58*
 Petroleum Iron Works Co., Sharon, Pa.
 PHOENIX IRON WORKS CO., Meadville, Pa., *p. 497*
 Prospect Boiler Co., Codurse Ave. & Power St., New Brunswick, N. J.
 Pyne Co., 927 Rupp St., Louisville, Ky.
 Reeves Bros. Co., Box K, Alliance, O.
 Riverside Boiler Works, Inc., 491 Main St., Cambridge, Mass.
 Ruemmel-Dawley Mfg. Co., 3900 Chouteau Ave., St. Louis, Mo.
 *SCAIFE & SONS CO., WM. B., Pittsburgh, Pa., *p. 103, 498*
 Smith & Son Co., Samuel, 130-150 Railroad Ave., Paterson, N. J.
 SPRINGFIELD BOILER CO., Springfield, Ill., *p. 60*
 Star Boiler Works, Clinton, Ia.
 Steacy-Schmidt Mfg. Co., 230 E. Hay St., York, Pa.
 Struthers-Wells Co., Warren, Pa.
 Treadwell Co., M. H., 140 Cedar St., New York
 Treadwell Construction Co., Midland, Pa.
 Turl Iron & Car Co., Inc., 50 Broad St., New York
 Union Boiler & Mfg. Co., Lebanon, Pa.
 UNION IRON WORKS, Erie, Pa., *p. 61*
 United Iron Works Co., Kansas City, Mo.
 VOGT MACHINE CO., HENRY, Louisville, Ky., *p. 63*
 WALSH & WEIDNER BOILER CO., Chattanooga, Tenn., *p. 64*
 Walton & Son, C. J., 1221 W. Main St., Louisville, Ky.
 WASHBURN & GRANGER, 50 Church St., New York., *p. 91*
 Warren City Tank & Boiler Co., Warren, O.
 Western Drop Forge Co., Marion, Ind.
 Wholey Boiler Works, Providence, R. I.
 *WICKES BOILER CO., Saginaw, Mich., *p. 66*
 WOOD & CO., R. D., Philadelphia, Pa., *p. 458*
 —Steel (Glass Enameled)
 PFAUDLER CO., Rochester, N. Y., *p. 499*
 —Storage
 *BIGELOW CO., 76 River St., New Haven, Conn., *p. 40*
 BLAW-KNOX CO. (Knox), Pittsburgh, Pa., *p. 489*
 Butler Mfg. Co., 1326 Grand Ave., Kansas City, Mo.
 CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky., *p. 201*
 Chicago Bridge & Iron Works, 37 W. Van Buren St., Chicago, Ill.
 COLE MFG. CO., R. D., Newnan, Ga., *p. 41*
 Godfrey, Keeler Co., 70 Warren St., New York
 Hammond Iron Works, Warren, Pa.
 HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa., *p. 104, 105*
 Kaw Boiler Works Co., Kansas City, Mo.
 KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J., *p. 404*
 KROESCHELL BROS. CO., 460 West Erie St., Chicago, Ill., *p. 56*
 Lancaster Iron Works, Inc., Lancaster, Pa.
 Lord & Burnham Co., 2 Main St., Irvington-on-Hudson, N. Y.
 McAleenan Bros. Co., 25th & R. R. Sts., Pittsburgh, Pa.
 MILWAUKEE RELIANCE BOILER WORKS, Milwaukee, Wis., *p. 112*
 MORRISON BROS., Dubuque, Ia., *p. 495*
 OIL CITY BOILER WORKS, Oil City, Pa., *p. 58*
 PFAUDLER CO., Rochester, N. Y., *p. 499*

Tan

See Catalogue Section for data of firms listed in capital type

TANKS (Continued)**—Storage**

PHOENIX IRON WORKS CO., Meadville, Pa... *p.* 497

Richmond Water Softener Co., Richmond, Ind.
Riverside Boiler Works, Inc., 491 Main St., Mass.

Ruemmell-Dawley Mfg. Co., 3900 Chouteau Ave., St. Louis, Mo.

***SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... *pp.* 103, 498

Schofield's Sons Co., J. S., Macon, Ga.
Sharpsville Boiler Works Co., Sharpsville, Pa.

Standard Boiler & Plate Iron Co., Niles, O.
WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p.* 64

Warren City Tank & Boiler Co., Warren, O.
Wilson Steam Boiler Co., 1919-27 S. 20th St., Omaha, Nebr.

WOOD & CO., R. D., Philadelphia, Pa... *p.* 458

—Storage (Cast Iron)

***GREEN ENGINEERING CO.**, East Chicago, Ind... *pp.* 80, 81

Storage (Cereal)

Warren City Tank & Boiler Co., Warren, O.

—Tower

CALDWELL CO., INC., W. E., 340 E. Brandeis St., Louisville, Ky... *p.* 201

Chicago Bridge & Iron Works, 37 W. Van Buren St., Chicago, Ill.

COLE MFG. CO., R. D., Newnan, Ga... *p.* 41

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p.* 494

***SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... *pp.* 103, 498

Schofield's Sons Co., J. S., Macon, Ga.
WALSH & WEIDNER BOILER CO., Chattanooga, Tenn... *p.* 64

WOOD & CO., R. D., Philadelphia, Pa... *p.* 458

—Welded

American Welding Co., Carbondale, Pa.
BLAW-KNOX CO. (Knox), Pittsburgh, Pa... *p.* 489

Cave Welding & Mfg. Co., 32 Liberty St., Springfield, Mass.

COLE MFG. CO., R. D., Newnan, Ga... *p.* 41

Farrar & Trefts, Inc., Perry & Illinois Sts., Buffalo, N. Y.

Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia, Pa.

KOVEN & BROTHER, L. O., 154 Ogden Ave., Jersey City, N. J... *p.* 494

Pennsylvania Boiler Works, 12th & Penna. Ave., Erie, Pa.

PFAUDLER CO., Rochester, N. Y... *p.* 499

***SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... *pp.* 103, 498

Turner Oil Filter Co., Niles, Mich.
Walton & Son, C. J., 1221 W. Main St., Louisville, Ky.

Whitney Felker Co., E. Tioga & Memphis Sts., Philadelphia, Pa.

Wood Mfg. Co., John, Conshohocken, Pa.

TANNERS' MACHINERY

STROUD & CO., E. H., 928-934 Fullerton Ave., Chicago, Ill... *pp.* 466, 467

TAP EXTENSIONS

Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.

TAPPING AND VALVE INSERTING MACHINES (Water)

Lennox Machine Co., 2553 W. 16th St., Chicago, Ill.

Mueller Mfg. Co., H., Decatur, Ill.

TAPPING ATTACHMENTS

Bicknell-Thomas Co., Greenfield, Mass.
Errington Mechanical Laboratory, 39 Cortlandt St., New York

***GREENFIELD TAP & DIE CORP'N**, Greenfield, Mass... *pp.* 374, 375

LANDIS MACHINE CO., INC., Waynesboro, Pa... *pp.* 372, 373

MCCROSKY REAMER CO., Meadville, Pa... *pp.* 380, 381

Peter Brothers' Mfg. Co., Algonquin, Ill.
Procunier, William L., 549 Washington Blvd., Chicago, Ill.

St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo.

Wahlstrom Tool Co., 5520 2nd Ave., Brooklyn, N. Y.

WHITNEY MFG. CO., Hartford, Conn... *p.* 367

TAPPING MACHINES

Acme Machinery Co., Cleveland, Ohio
Allen Machine Co., 1585 Columbus Rd., N. W., Cleveland, O.

Anderson Die Machine Co., Bridgeport, Conn.
Barnes Drill Co., Inc., 814-830 Chestnut St., Rockford, Ill.

Brown Co., H. B., East Hampton, Conn.
Burke Machine Tool Co., Conneaut, O.

Evans Stamping & Plating Co. (Tuttle), Cushman St., Taunton, Mass.

***GREENFIELD TAP & DIE CORP'N**, Greenfield, Mass... *pp.* 374, 375

Meriden Machine Tool Co., Meriden, Conn.
Partridge, E. O., 2047-2049 W. Lake St., Chicago, Ill.

PRATT & WHITNEY CO., 111 Broadway, New York... *p.* 344

Rickett-Shafer Co., 613 W. 11th St., Erie, Pa.
St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo.

Smith Mfg. Co., A. P., East Orange, N. J.

WEBSTER & PERKS TOOL CO., 300 Center St., Springfield, O... *p.* 365

—Bench

SLOAN & CHACE MFG. CO., LTD., Sixth Ave., Cor. N. 13th St., Newark, N. J... *p.* 357

—Multiple Head

Moline Tool Co., Moline, Ill.
WILLIAMS, WHITE & CO., Moline, Ill... *p.* 314

—Turret

NATIONAL AUTOMATIC TOOL CO., Richmond, Ind... *p.* 346

Paragon Gear Works (Tuttle), Taunton, Mass.
Turner Machine Co. (Quint), Danbury, Conn... *p.* 347

WOOD TURRET MACHINE CO., Brazil, Ind... *pp.* 330, 331

TAPS AND DIES

American Tap & Die Co., Greenfield, Mass.
Bay State Tap & Die Co., Mansfield, Mass.

Brubaker & Bros., W. L., 50 Church St., New York

Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Rumford Ave., Mansfield, Mass.

Carpenter Tap & Die Co., J. M., Pawtucket, R. I.
Conant & Donelson Co. (Reliable), Conway, Mass.

***GREENFIELD TAP & DIE CORP'N**, Greenfield, Mass... *pp.* 374, 375

LANDIS MACHINE CO., INC., Waynesboro, Pa... *p.* 372, 373

Mergenthaler Co., Baltimore, Md.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Pipe Machinery Co., 930 E. 70th St., Cleveland, Ohio

PRATT & WHITNEY CO., 111 Broadway, New York... *p.* 344

Russell Mfg. Co., Greenfield, Mass.
Standard Tool Co., 6900 Central Ave., Cleveland, O.

Winter Bros. Co., Wrentham, Mass.

TAPS, COLLAPSING

Errington Mechanical Laboratory, 39 Cortlandt St., New York

Geometric Tool Co., New Haven, Conn.
MANUFACTURERS EQUIPMENT CO., Waller & Fillmore Sts., Chicago, Ill... *p.* 382

Murphy Machine & Tool Co., 85 Porter St., Detroit, Mich.

PRATT & WHITNEY CO., 111 Broadway, New York... *p.* 344

Victor Tool Co., Waynesboro, Pa.

Tan

TAE DISTILLING PLANTS

Koppers Co., H., Union Arcade, Pittsburgh, Pa.

TELEPHERS

(See Tramrail Systems, Overhead)

TEMPERATURE REGULATORS

(See Regulators, Temperature)

TESTING MACHINESEmery, A. H., Maple Ave., Glenwood, Conn.
Harris Engrg. Co., H. E., 1047 Broad St., Bridgeport, Conn.Holz, Herman A., 1 Madison Ave., New York
OLSEN TESTING MACHINE CO., TINIUS,
500 N. 12th St., Philadelphia, Pa... p. 511Pittsburgh Instrument & Machine Co., 101
Water St., Pittsburgh, Pa.RIEHL BROS. TESTING MACHINE CO.,
1424 N. 9th St., Philadelphia, Pa... p. 512**TEXTILE MACHINERY**

Barbar-Colman Co., Rockford, Ill.

Curtis & Marble Machine Co., 78 Cambridge

St., Worcester, Mass.

Davis & Furber Machine Co., North Andover,

Mass.

Eastwood Co., Benjamin, Paterson, N. J.

Franklin Machine Co., 189 Charles St., Providence,

R. I.

Lyall, J. & W., Passaic, N. J.

Perkins, Henry F., 46 Walnut Ave., Andover,

Mass.

Rice, Barton & Fales Machine & Iron Co., Wor-

cester, Mass.

Text Corp'n, Bay State Bldg., Lawrence, Mass.

Tillotson Humidifier Co., Providence, R. I.

Trump Bros. Machine Co., Beech & Anchorage

St., Wilmington, Del.

Universal Winding Co., Boston, Mass.

Whitin Machine Works, Whitinsville, Mass.

TEXTILE WET FINISHING MACHINERY

*HUNT MACHINE CO., RODNEY, Orange,

Mass... p. 449

THERMOCOUPLES

BROWN INSTRUMENT CO., Philadelphia,

Pa... p. 531

*FOXBORO CO., INC., Foxboro, Mass... p. 533

Frink Pyrometer Co., Lancaster, O.

THERMOMETERS

AMERICAN STEAM GAUGE & VALVE

MFG. CO., Boston, Mass... pp. 142, 143

Berg Mfg. Co., James, 3707 12th Ave., Brooklyn,

N. Y.

BRISTOL CO., Waterbury, Conn... p. 530

BROWN INSTRUMENT CO., Philadelphia,

Pa... p. 531

CROSBY STEAM GAGE & VALVE CO., 40

Central St., Boston, Mass... p. 527

*FOXBORO CO., INC., Foxboro, Mass... p. 533

Green, Henry J., 1191 Bedford Ave., Brooklyn,

N. Y.

HAYS CORP'N, JOS. W., Michigan City, Ind.

... p. 523

National Gauge Co., 300 Pacific St., Brooklyn,

N. Y.

Precision Thermometer & Instrument Co., 1434

Brandywine St., Philadelphia, Pa.

Queen-Gray Co., 616-620 Chestnut St., Philadel-

phia, Pa.

Quimby Engineering Co., 915 Ridge Ave., Phila-

delphia, Pa.

*SCHAEFFER & BUDENBERG MFG. CO.,

Brooklyn, N. Y... p. 534

Standard Thermometer Co., 65 Shirley St., Bos-

ton, Mass.

Tagliabue Mfg. Co., C. J., 18-88 33rd St., Brook-

lyn, N. Y... p. 535

Thwing Instrument Co., 3339 Lancaster Ave.,

Philadelphia, Pa.

Wagner, Carl H., 1944 W. Albany Ave., Chicago,

Ill.

—Distance (Electric Resistance)

BRISTOL CO., Waterbury, Conn... p. 530

BROWN INSTRUMENT CO., Philadelphia,

Pa... p. 531

ENGELHARD, CHARLES, 30 Church St., New

York... p. 532

Hanovia Chemical & Mfg. Co., Chestnut St. &
N. J. R. R. Ave., Newark, N. J.

Leeds & Northrup Co., 4901 Stanton Ave., Phila-

delphia, Pa.

—High Range

BROWN INSTRUMENT CO., Philadelphia,

Pa... p. 531

*FOXBORO CO., INC., Foxboro, Mass... p. 533

TAYLOR INSTRUMENT COS., Rochester,

N. Y... p. 536

THERMOSTATS

American Thermostat Co., 101 Mechanic St.,

Newark, N. J.

Beers Bros. Thermostat Co., Rochester, N. Y.

Bishop & Babcock Co., E. 49th & Hamilton Ave.,

Cleveland, Ohio

BRISTOL CO., Waterbury, Conn... p. 530

BROWN INSTRUMENT CO., Philadelphia,

Pa... p. 531

Consolidated Car-Heating Co., 413 N. Pearl St.,

Albany, N. Y.

Equitherm Control Corp'n, 30 Church St., New

York

*FOXBORO CO., INC., Foxboro, Mass... p. 533

Jewell Mfg. Co., 27 Clark St., Auburn, N. Y.

Johnson Service Co., Milwaukee, Wis.

Klipfel Mfg. Co., 2651 W. Harris St., Chicago,

Ill.

National Regulator Co., 145 E. 34th St., New

York

Powers Regulator Co., 5 S. Wabash Ave., Chi-

cago, Ill.

Roys' Heat Control Co., 915 Gates Ave., Brook-

lyn, N. Y.

*SARCO CO., INC., Woolworth Bldg., New

York... pp. 148, 149

Standard Regulator Co., 282 South St., Newark,

N. J.

TAGLIABUE MFG. CO., C. J., 18-88 33rd St.,

Brooklyn, N. Y.

Thermograde Valve Co., Howard St., Water-

town, Mass.

Wagner, Carl H., 1944 W. Albany Ave., Chicago,

Ill.

—Electric

American Thermostat Co., 101 Mechanic St.,

Newark, N. J.

Johnson Service Co., Milwaukee, Wis.

—Pneumatic

Johnson Service Co., Milwaukee, Wis.

THICKENERS

Dorr Co., 1909 17th St., Denver Colo.

THREAD CUTTING TOOLS

(See Tools, Thread Cutting)

THREADING MACHINES**—Bolt**

Boynton & Plummer, Inc., Chester Depot, Vt.

LANDIS MACHINE CO., INC., Waynesboro,

Pa... pp. 372, 373

—Pipe

Johnston Co., Wm. T., Cincinnati, O.

LANDIS MACHINE CO., INC., Waynesboro,

Pa... pp. 372, 373

McMann & Taylor Co., 104-106 John St., New

York

Pipe Machinery Co., 930 E. 70th St., Cleveland,

Ohio

Threading Machine Co., Sandusky, O.

—Sheet Metal

LANDIS MACHINE CO., INC., Waynesboro,

Pa... pp. 372, 373

Lefler & Co., Charles, 49-73 Clymer St., Brook-

lyn, N. Y.

V & O Press Co., Glendale, L. I., N. Y.

TICKET CANCELLING MACHINES

INGERSOLL-RAND CO., 11 Broadway, New

York... pp. 428, 429

TIERING MACHINES, PORTABLE

Economy Engineering Co., 415 S. Washtenaw

Ave., Chicago, Ill.

Revolator Co., 344 Garfield Ave., Jersey City,

N. J.

Tie

TIE WORKING MACHINES (Railway)

Greenlee Bros. & Co., Rockford, Ill.

TIES, STEEL (Mine)

Fairmont Mining Machinery Co., Fairmont, W. Va.

TILE MACHINERY

BONNOT CO., Canton, O...p. 464

Crossley Machine Co., State & Monmouth Sts., Trenton, N. J.

TILES**—Acid Resistant**

United States Roofing Tile Co., East Sparta, O.

—Asphalt

HASTINGS PAVEMENT CO., 25 Broad St., New York...p. 507

—Hollow

Mauer & Son, Henry, 420 E. 23rd St., New York

TIME RECORDERS

Baird Equipment Co., 319-325 W. Ohio St., Chicago, Ill.

BRISTOL CO., Waterbury, Conn...p. 530

BROWN INSTRUMENT CO., Philadelphia, Pa...p. 531

*FOXBORO CO., INC., Foxboro, Mass...p. 533

*SCHAEFFER & BUDENBERG MFG. CO., Brooklyn, N. Y...p. 534

Simplex Time Recorder Co., Gardner, Mass.

TIN FOIL MACHINERY

Birmingham Iron Foundry, Derby, Conn.

TINNING EQUIPMENT, WIRE

Turner, Vaughan & Taylor Co., Cuyahoga Falls, Ohio

TINPLATE MACHINERY

ANDERSON FOUNDRY & MACHINE WORKS, Anderson, Ind...p. 27

TINPLATES

American Sheet & Tin Plate Co., Pittsburgh, Pa.

Bethlehem Steel Co., South Bethlehem, Pa.

LaBelle Iron Works, Steubenville, O.

Tie

TINSMITHS' TOOLS AND MACHINES

Dreis Krump Mfg. Co., 2919 So. Halsted St., Chicago, Ill.

NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y...p. 312

TINWARE MACHINERY

BLISS CO., E. W., 19 Adams St., Brooklyn, N. Y...pp. 310, 311

Lefler & Co., Charles, 49-73 Clymer St., Brooklyn, N. Y.

TOLEDO MACHINE & TOOL CO., Toledo, O...p. 313

TIRE SETTING MACHINES (Hydraulic)

Lourie Mfg. Co., Springfield, Ill.

TIRE WELDING MACHINES

LONG & ALLSTATTER CO., Hamilton, O...p. 309

TIRES, LOCOMOTIVE

Edgewater Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.

Railway Steel Spring Co., 30 Church St., New York

TOBACCO MACHINERY

American Machine & Foundry Co., 250 Second Ave., Brooklyn, N. Y.

Miller, DuBrul & Peters Mfg. Co., 507-521 E. Pearl St., Cincinnati, O.

STROUD & CO., E. H., 928 934 Fullerton Ave., Chicago, Ill...p. 466, 467

TONGS (Crucible and Pan)

KENWORTHY, INC., CHARLES F., Waterbury, Conn...p. 414, 415

New Jersey Foundry & Machine Co., 88 West St., New York...p. 273

TOOL POSTS (Turret)

McCROSKEY REAMER CO., Meadville, Pa...pp. 380, 381

TOOLS**—Boiler Makers'**

Helwig Mfg. Co., St. Paul, Minn.

—Boring

Detroit Twist Drill Co., 634 Fort St., W., Detroit, Mich.

HALL MFG. CO., Abington, Mass...p. 379

Kelly Reamer Co., 1555 Columbus Road, Cleveland, O.

Lawson & Co., Inc., 90 West St., New York

Lovejoy Tool Company, Inc., Springfield, Vt.

Marvin & Casler Co., Canastota, N. Y.

Porter-Cable Machine Co., 1708 N. Salina St., Syracuse, N. Y.

Rogers Works, Inc., John M., Gloucester City, N. J.

Schellenbach-Hunt Tool Co., 120 Opera Place, Cincinnati, O.

Union Tool Co., Orange, Mass.

—Boring (Adjustable and Expansion)

Davis Boring Tool Co. (Davis), 3722 Forest Park Blvd., St. Louis, Mo.

McCROSKEY REAMER CO., Meadville, Pa...p. 380, 381

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...p. 397

—Broaching

Lapointe Co., J. N., New London, Conn.

LAPOINTE MACHINE TOOL CO., Hudson, Mass...p. 351

—Diamond

Dessau, S. Maurice, 6 Maiden Lane, New York

—Edge

Plumb, Fayette R., Bridesburg P. O., Philadelphia, Pa.

—Lathe

Haynes Stellite Co., Kokomo, Ind.

HOUSTON, STANWOOD & GAMBLE CO., Cincinnati, O...pp. 48, 49, 321

Lovejoy Tool Company, Inc., Springfield, Vt.

Pierce Machine Tool Co., 617 W. Jackson Blvd., Chicago, Ill.

Ready Tool Co., Bridgeport, Conn.

Union Tool Co., Orange, Mass.

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...p. 397

—Machinists' Small

Athol Machine Co., Athol, Mass.

Billings & Spencer Co., Hartford, Conn.

Brown & Sharpe Mfg. Co., Promenade St., Providence, R. I.

CLEVELAND TWIST DRILL CO., Cleveland, O...p. 378

Cowles Tool Co., 2086 W. 110th St., Cleveland, Ohio

Goodell-Pratt Co., Greenfield, Mass.

Miles Co., George, Winsted, Conn.

Plumb, Fayette R., Bridesburg P. O., Philadelphia, Pa.

PRATT & WHITNEY CO., 111 Broadway, New York...p. 344

Slocumb Co., J. T., 35 Oxford St., Providence, R. I.

Stanley Rule & Level Co., New Britain, Conn.

Starrett Co., L. S., Athol, Mass.

Swedish Gage Co., Inc., 245 W. 55th St., New York

Union Tool Co., Orange, Mass.

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...p. 397

—Oil Well

Hughes Tool Co., Houston, Texas.

—Planer

CINCINNATI PLANER CO., Oakley, Cincinnati, O...pp. 338, 339

Haynes Stellite Co., Kokomo, Ind.

Lovejoy Tool Company, Inc., Springfield, Vt.

Union Tool Co., Orange, Mass.

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...p. 397

—Pneumatic

Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill.

Dallet Co., Thomas H., Broad & Federal Sts., Philadelphia, Pa.

Dayton Pneumatic Tool Co., Dayton, O.
 Henly Iron Works, San Francisco, Cal.
 Independent Pneumatic Tool Co. (Thor), 1307
 S. Michigan Ave., Chicago, Ill.
 INGERSOLL-RAND CO., 11 Broadway, New
 York... *pp.* 428, 429
 Keller Pneumatic Tool Co., Grand Haven, Mich.
 Kotten Machine Co., West Side Ave. & Penn
 R. R., Jersey City, N. J.
 Oldham & Son Co., George, 4316-22 Lackawanna
 St., Frankford, Philadelphia, Pa.
 Pittsburgh Pneumatic Co., Canton, O.

—**Punch Press**
 SLOCUM, AVRAM & SLOCUM LABO-
 RATORIES, INC., 531-537 W. 21st St., New
 York... *p.* 538

—**Refacing (Pump Valve)**
 Furness Bros. Co., 1615 W. Walnut St., Chicago,
 Ill.

—**Roll**
 Tinker & Sons Co., F., Pittsburgh, Pa.

—**Special**
 Boger-Meyer Machine & Tool Co., 59-65 Mc-
 Whorter St., Newark, N. J.
 Buckeye Twist Drill Co., Alliance, O.
 BURROUGHS CO., CHARLES, Newark, N. J.
 ... *p.* 454

City Machine & Tool Works, Dayton, Ohio
 Coleman Fare Box Co., Ltd., 1191 Bathurst St.,
 Toronto, Canada
 Columbus Die, Tool & Machine Co., Columbus,
 Ohio

Diamant Tool & Mfg. Co., 164 Emmett St.,
 Newark, N. J.
 Elgin Tool Works, Elgin, Ill.
 Fraser Co., Warren F., 81 Freeport St., Boston,
 Mass.

Krasberg Mfg. Co., 536 Lake Shore Drive,
 Chicago, Ill.

Lansing Stamping & Tool Co., Lansing, Mich.
 MANUFACTURERS EQUIPMENT CO., Wal-
 ler & Fillmore Sts., Chicago, Ill... *p.* 382

MEHL MACHINE TOOL & DIE CO., Roselle,
 N. J... *pp.* 376, 377

Meyers Co., W. F., Bedford, Ind.
 Modern Mfg. Co., 75 Third St., Bridgeport,
 Conn.

NATIONAL TOOL CO., Cleveland, O... *p.* 383
 NELSON BLOWER & FURNACE CO., 11
 Elkins St., Boston, Mass... *p.* 67

Production Tool & Engineering Co., 507 Jack-
 son Boulevard, Chicago, Ill.

SLOCUM, AVRAM & SLOCUM LABO-
 RATORIES, INC., 531-537 W. 21st St., New
 York... *p.* 538

Taft-Peirce Mfg. Co., Woonsocket, R. I.
 Waltham Machine Works, Waltham, Mass.

—**Thread Cutting**
 Borden Co. (Beaver), Warren, O.
 Geometric Tool Co., New Haven, Conn.
 Hart Mfg. Co., 2315 E. 20th St., Cleveland, O.
 *JONES AND LAMSON MACHINE CO.,
 Springfield, Vt... *pp.* 324, 325, 326, 327
 LANDIS MACHINE CO., INC., Waynesboro,
 Pa... *pp.* 372, 373

MODERN TOOL CO., Erie, Pa... *pp.* 360, 361
 Oster Mfg. Co., 2057 E. 61st Place, Cleveland, O.
 PRATT & WHITNEY CO., 111 Broadway, New
 York... *p.* 344

Rivett Lathe & Grinder Co., Brighton, Boston,
 Mass.

Union Tool Co., Orange, Mass

Vesterdahl & Co., Karl, 90 West St., New York

—**Valve Reseating**
 Draper Mfg. Co., 2417 Wright St., Port Huron,
 Mich.

Skinner Co., M. B., 558-562 Washington Boul.,
 Chicago, Ill.

—**Wood Working**
 Greenlee Bros. & Co., Rockford, Ill.

Stanley Rule & Level Co., New Britain, Conn.

FORCHES
 Gem Mfg. Co., 1229-43 Goebel St., N. S., Pitts-
 burgh, Pa.

Hauck Mfg. Co., 101 11th St., Brooklyn, N. Y.

—**Oil Burning**

Mahr Mfg. Co., Minneapolis, Minn.

—**Welding and Cutting**

Davidson Gas Burner & Welding Co., N. C., 3145
 Penn Ave., Pittsburgh, Pa.

K-C WELDING & CUTTING CO., INC., 556
 W. 34th St., New York... *p.* 410

MILBURN CO., ALEXANDER, Baltimore,
 Md... *p.* 420

OXWELD ACETYLENE CO., 646-686 Freling-
 huysen Ave., Newark, N. J... *p.* 421

TOTE BOXES

(See Boxes, Tote)

TRACK

—**Cast Iron Plate**

Easton Car & Construction Co., Easton, Pa.

*HUNT CO., INC., C. W., West New Brighton,
 Staten Island, N. Y... *pp.* 252, 253

WASHBURN & GRANGER, 50 Church St.,
 New York... *p.* 91

—**Industrial Railway**

Chase Foundry & Mfg. Co., Columbus, O.

Easton Car & Construction Co., Easton, Pa.

*HUNT CO., INC., C. W., West Brighton,
 Staten Island, N. Y... *pp.* 252, 253

Lakewood Engineering Co., Berea Road, Clevel-
 and, Ohio

NEW JERSEY FOUNDRY & MACHINE CO.,
 88 West St., New York... *p.* 273

Sackett Screen & Chute Co., H. B., 1679-1691
 Elston Ave., Chicago, Ill.

Simplex Surface Contact Co., Williamsport, Pa.

Turl Iron & Car Co., Inc., 50 Broad St., New
 York

—**Overhead**

*BROWN HOISTING MACHINERY CO.,
 Cleveland, O... *p.* 265

Reading Chain & Block Corp'n., Reading, Pa.

Ricker Mfg. Co., Rochester, N. Y.

*SHEPARD ELECTRIC CRANE & HOIST
 CO., Montour Falls, N. Y... *pp.* 274, 275

TRACTORS

—**Farm**

*ALLIS-CHALMERS MFG. CO., Milwaukee,
 Wis... *p.* 15

Austin Co., Inc., F. C., 609-80 E. Jackson St.,
 Chicago, Ill.

Avery Co., Peoria, Ill.

Best Gas Tractor Co., C. L., Dayton, O.

Buckeye Mfg. Co., Anderson, Ind.

Burrell Mfg. & Supply House, Kankakee, Ill.

Case Threshing Machine Co., J. I., Racine, Wis.
 Cleveland Tractor Co., Cleveland, O.

Dayton-Dick Co., Quincy, Ill.

Galloway Co., Wm., Waterloo, Ia.

Hart-Parr Co., Charles City, Iowa

Hettinger Engine Co., Bridgeton, N. J.

Holt Mfg. Co., Stockton, Cal.

Imperial Machinery Co., 1611 Central Ave.,
 Minneapolis, Minn.

Lawson Mfg. Co., John, New Holstein, Wis.

Little Giant Co., Mankato, Minn.

Minneapolis Steel & Machinery Co., 29th &
 Minnehaha Ave., Minneapolis, Minn.

National Tractor Co., Cedar Rapids, Ia.

Phoenix Mfg. Co., Eau Claire, Wis.

Russell & Co., Massillon, O.

Staudte Mfg. Co., E. G., 2675 University Ave.,
 St. Paul, Minn.

Union Tool Co., Torrance, Cal.

Wallis Tractor Co., Racine, Wis.

Waterloo Gasoline Engine Co., Waterloo, Ia.

Yuba Mfg. Co., Marysville, Cal.

—**Industrial**

Automatic Transportation Co., 2933 Main St.,
 Buffalo, N. Y.

Cleveland Tractor Co., Cleveland, O.

Elwell-Parker Electric Co., Cleveland, O.

*HUNT CO., INC., C. W., West New Brighton,
 Staten Island, N. Y... *pp.* 252, 253

Lakewood Engineering Co., Berea Road, Clevel-
 and, Ohio

TRACTORS (Continued)**—Industrial**

Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill.

TRAMRAIL SYSTEMS (Overhead)

*BROWN HOISTING MACHINERY CO., Cleveland, O... p. 265

Cameron Engineering Co., East Stroudsburg, Pa.

COBURN TROLLEY TRACK MFG. CO., Holvake, Mass... p. 276

FARNHAM MFG. CO., 31-39 Indiana St., Buffalo, N. Y... p. 277

Granger Co., A. D., 15 Park Row, New York

*LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... p. 256

NEW JERSEY FOUNDRY & MACHINE CO., 88 West St., New York... p. 273

Philadelphia Tramrail Co., Front & Tusculum Sts., Philadelphia, Pa.

Randall Tramrail Co., 331 N. 2nd St., Philadelphia, Pa.

Reading Chain & Block Corp'n, Reading, Pa.

Richards-Wilcox Mfg. Co., Aurora, Ill.

*SHEPARD ELECTRIC CRANE & HOIST CO., Montour Falls, N. Y... pp. 274, 275

United Telephage Co., 243 Washington St., Jersey City, N. J.

Whitehead & Kales Iron Works, Beecher Ave. & M. C. R. R., Detroit, Mich.

TRAMWAYS**—Bridge**

*BROWN HOISTING MACHINERY CO., Cleveland, O... p. 265

Heyl & Patterson, Inc., Pittsburgh, Pa.

*LINK-BELT CO., 39th St., & Stewart Ave., Chicago, Ill... p. 256

ROBINS CONVEYING BELT CO., Park Row Bldg., New York... p. 257

—Wire Rope

American Steel & Wire Co., 72 W. Adam St., Chicago, Ill.

Broderick & Bascom Rope Co., St. Louis, Mo.

Leschen & Sons Rope Co., A., St. Louis, Mo.

MACOMBER & WHYTE ROPE CO., Kenosha, Wis... p. 280

*ROEBLING'S SONS CO., JOHN A., Trenton, N. J... p. 281

United States Steel Products Co., 4th Ave. & Connecticut St., Seattle, Wash.

TRANSFER TABLES

INDUSTRIAL WORKS, Bay City, Mich... pp. 266, 267

TRANSFORMERS, ELECTRIC

Adams-Bagnall Electric Co., Cleveland, O.

Burke Electric Co., Erie, Pa.

*GENERAL ELECTRIC CO., Schenectady, N. Y... pp. 20, 21, 521

Wagner Electric Mfg. Co., 6400 Plymouth Ave., St. Louis, Mo.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa... pp. 114, 115

TRANSMISSION MACHINERY

(See Power Transmission Machinery)

TRANSMISSION TOWERS

BLAW-KNOX CO. (Blaw), Pittsburgh, Pa... p. 489

TRANSMISSIONS**—Automobile**

Brown-Lipe Gear Co., Syracuse, N. Y.

Detroit Gear & Machine Co., 127-151 Franklin St., Detroit, Mich.

Footo Bros. Gear & Machine Co., 213 N. Curtis St., Chicago, Ill.

Grant-Lees Gear Co., 2367 E. 69th St., Cleveland, O.

VAN DORN & DUTTON CO., Cleveland, O... p. 370

Warner Gear Co., Muncie, Ind.

—Marine

Evans Stamping & Plating Co. (Paragon), Cushman St., Taunton, Mass.

Paragon Gear Works (Paragon), Taunton, Mass.

—Right Angle

Almond Mfg. Co., T. R., Ashburnham, Mass.

—Tractor

Hamilton Gear & Machine Co., Van Horne Street, Toronto, Canada

—Variable Speed

Moore & White Co., Philadelphia, Pa.

REEVES PULLEY CO., Columbus, Ind... p. 210

Waterbury Tool Co., Waterbury, Conn.

Yocom & Son, Jas., 145 N. 2nd St., Philadelphia, Pa.

TRAP ATTACHMENTS

Flinn, Richard J., W. Roxbury, Mass.

TRAPS**—Condenser**

Farnsworth Co., Conshohocken, Pa.

—Gasoline

Fisher Governor Co., Marshalltown, Iowa

Strong, Carlisle & Hammond Co., Cleveland, O.

—Radiator

Armstrong Machine Works, Three Rivers, Mich.

D. G. C. Trap & Valve Co., 18 E. 41st St., New York

*JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... p. 162

Marsh & Co., James P., 118 S. Clinton St., Chicago, Ill.

*SARCO CO., INC., Woolworth Bldg., New York... pp. 148, 149

Vapor-Vacuum Heating Co., Philadelphia, Pa.

WEBSTER & CO., WARREN, Camden, N. J... pp. 108, 109, 110

—Return

AMERICAN BLOWER CO., Detroit, Mich... pp. 434, 435

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... pp. 120, 121, 122, 123

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass... p. 144

Farnsworth Co., Conshohocken, Pa.

HOBSON, RUSSELL B., New Brighton, N. Y... p. 150

Illinois Engineering Co., Racine at 21st St., Chicago, Ill.

KIELEY & MUELLER, INC., 34 W. 13th St., New York... p. 146

Lytton Mfg. Corp'n, Franklin, Va.

Nashua Machine Co., Nashua, N. H.

Roy's Heat Control Co., 915 Gates Ave., Brooklyn, N. Y.

Sorge, Jr. & Co., A., Monadnock Block, Chicago, Ill.

WEBSTER & CO., WARREN, Camden, N. J... pp. 108, 109, 110

—Steam

Albany Steam Trap Co., 317 N. Pearl St., Albany, N. Y.

AMERICAN BLOWER CO., Detroit, Mich... pp. 434, 435

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... p. 140

AMERICAN STEAM GAUGE & VALVE MFG CO., Boston, Mass... pp. 142, 143

Anderson Co., V. D. W. 96th St., Cleveland, O.

Armstrong Machine Works, Three Rivers, Mich.

Barton, John W., 2707 Vestry Ave., Cleveland, O.

Bourdon Co., Burlington, Vt.

Boylston Steam Specialty Co., 116-122 W. Illinois St., Chicago, Ill.

Burrows Mfg. Co. 41-43 N. Water St., York, Pa.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... pp. 120, 121, 122, 123

Cyclone Grate Bar Co., Buffalo, N. Y.

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass... p. 144

D. G. C. Trap & Valve Co., 18 E. 41st St., New York

Fisher Governor Co., Marshalltown, Iowa

Flinn, Richard J., W. Roxbury, Mass.

Tra

FORD CO., THOMAS P., 407 Broome St., New York... *p. 125*
 Fookett & Bishop Co., New Haven, Conn.
 Illinois Engineering Co., Racine at 21st St., Chicago, Ill.
 *JENKINS BROS., 80 White St., New York...
pp. 128, 129
 *JOHNS-MANVILLE CO., H. W., 296 Madison Ave., New York... *p. 162*
 KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*
 Kitts Mfg. Co., Oswego, N. Y.
 Kittle Steam Specialty Co., 60 E. 1st St., Oswego, N. Y.
 Linton Machine Co., 26 Cortlandt St., New York
 Lytton Mfg. Corp'n, Franklin, Va.
 McAuley Automatic Trap Co., Third St. & Penn Ave., Pittsburgh, Pa.
 Morehead Mfg. Co., Detroit, Mich.
 Nashua Machine Co., Nashua, N. H.
 Nason Mfg. Co. (Nason), 71 Fulton St., New York
 Nicholson & Co., W. H., Wilkes-Barre, Pa.
 Open Coil Heater & Purifier Co., Indianapolis, Ind.
 Patterson & Co., Frank L., 28 Cortlandt St., New York
 Plant Engineering & Equipment Co., 6 Church St., New York
 PRATT & CADY CO., INC., Hartford, Conn...
pp. 134, 135
 Reliance Gauge Column Co. (Reliance), Cleveland, Ohio
 Robertson Co., John F., 1001 Park Bldg., Pittsburgh, Pa.
 Ross Schofield Co., 17 Battery Place, New York
 *SARCO CO., INC., Woolworth Bldg., New York... *pp. 148, 149*
 SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*
 Squires Co., C. E., E. 40th St. & Kelley Ave., Cleveland, O.
 Steam Appliance Co., West Allis, Wis.
 Strong, Carlisle & Hammond Co., Cleveland, O.
 STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*
 Tillotson Humidifier Co., Providence, R. I.
 Tyler Underground Heating System, 815 S. Canal St., N. S., Pittsburgh, Pa.
 Vance-Vetter Co., Phipps Power Bldg., Pittsburgh, Pa.
 Watson & McDaniel Co., 142 N. 7th St., Philadelphia, Pa.
 Watts Regulator Co., 250-252 Lowell St., Lawrence, Mass.
 WEBSTER & CO., WARREN, Camden, N. J...
pp. 108, 109, 110
 Western Kieley Steam Specialty Co., 116-122 W. Illinois St., Chicago, Ill.
 WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*
 Williams Gauge Co., 543 Fourth Ave., Pittsburgh, Pa.
 Williams Valve Co., D. T., Cincinnati, O.
 Wright-Austin Co., 90 Woodbridge St., Detroit, Mich.
 —Vacuum
 AMERICAN BLOWER CO., Detroit, Mich...
pp. 434, 435
 AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*
 Barton, John W., 2707 Vestry Ave., Cleveland, O.
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*
 Flinn, Richard J., W. Roxbury, Mass.
 Nashua Machine Co., Nashua, N. H.
 Open Coil Heater & Purifier Co., Indianapolis, Ind.
 Peerless Engineering Co., 1253 First Nat'l Bank Building, Chicago, Ill.
 *SARCO CO., INC., Woolworth Bldg., New York... *pp. 148, 149*
 Strong, Carlisle & Hammond Co., Cleveland, O.
 WEBSTER & CO., WARREN, Camden, N. J...
pp. 108, 109, 110

TRENCH DIGGING MACHINERY

Auston Co., Inc., F. C., 609-80 E. Jackson St., Chicago, Ill.
 *BALL ENGINE CO., Erie, Pa... *p. 16*
 *LIDGERWOOD MFG. CO., 96 Liberty St., New York... *p. 271*
 Parson Co., Newton, Iowa
 Potter Mfg. Co., 3511 E. Washington St., Indianapolis, Ind.
 Thew Automatic Shovel Co., Lorain, Ohio
TRIMMING MACHINES (Tin Plate)
 Aetna Foundry & Machine Co., Warren, O.
 TORRINGTON MFG. CO., Torrington, Conn...
p. 483

TROLLEYS

*BROWN HOISTING MACHINERY CO., Cleveland, O... *p. 265*
 Chisholm & Moore Mfg. Co., Lakeside Ave. & E. 49th St., Cleveland, O.
 COBURN TROLLEY TRACK MFG. CO., Holyoke, Mass... *p. 276*
 FARNHAM MFG. CO., 31-39 Indiana St., Buffalo, N. Y... *p. 277*
 *FORD CHAIN BLOCK & MFG. CO., Second & Diamond Sts., Philadelphia, Pa... *p. 278*
 *GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*
 *LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill... *p. 256*
 Maris Bros., 56th St. & Gray's Ave., Philadelphia, Pa.
 Moore Co., Franklin, Winstead, Conn.
 NEW JERSEY FOUNDRY & MACHINE CO., 88 West St., New York... *p. 273*
 NUTTALL CO., R. D., Pittsburgh, Pa... *p. 195*
 Philadelphia Tramrail Co., Front and Tusculum Sts., Philadelphia, Pa.
 Reading Chain & Block Corp'n, Reading, Pa.
 Round & Son, D., Cleveland, O.
 Speidel, J. G., Reading, Pa.
 Wright Mfg. Co., Lisbon, O.

TRUCKS

—Elevating

Barrett-Cravens Co., 711 Transportation Bldg., Chicago, Ill.
 Clark Co., Geo. P., Windsor Locks, Conn.
 Cowan Truck Co., Holyoke, Mass.
 Holyoke Truck Co., 102 Race St., Holyoke, Mass.
 Lewis-Shepard Co., 48 Binford St., Boston, Mass.
 National Scale Co., Chicopee Falls, Mass.
 Plimpton Elevating Truck, 70 Fifth Ave., New York
 Stuebinger Truck Co., 141 E. 4th St., Cincinnati, O.
 Transmission Ball Bearing Co., Inc., 1050 Military Road, Buffalo, N. Y.

—Factory

Chase Foundry & Mfg. Co., Columbus, O.
 Clark Co., Geo. P., Windsor Locks, Conn.
 Cowan Truck Co., Holyoke, Mass.
 *DIAMOND STATE FIBRE CO., Bridgeport, Pa... *p. 298*
 Holyoke Truck Co., 102 Race St., Holyoke, Mass.
 Howe Scale Co. of N. Y., 341 Broadway, New York
 *HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y... *pp. 252, 253*
 McKinney Mfg. Co., Pittsburgh, Pa.
 Menasha Wood Split Pulley Co., Menasha, Wis.
 Pittsburgh Crane & Equipment Co., Pittsburgh, Pa.
 Plimpton Elevating Truck, 70 Fifth Ave., New York
 WASHBURN & GRANGER, 50 Church St., New York... *p. 91*

—Industrial (Storage Battery)

Automatic Transportation Co., 2933 Main St., Buffalo, N. Y.
 Baker Economic Transport Corp'n, 31 Nassau St., New York
 Buda Co., Railway Exchange Bldg., Chicago, Ill.
 Cowan Truck Co., Holyoke, Mass.
 Elwell-Parker Electric Co., Cleveland, O.

Tru

See Catalogue Section for data of firms listed in capital type

TRUCKS (Continued)**—Industrial (Storage Battery)**

General Vehicle Co., Inc., Long Island City, N. Y.

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y. . . pp. 252, 253

Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill.

—Lumber Car (Roller Bearing)

Ottumwa Iron Works, Ottumwa, Ia.

—Mine Car (Roller Bearing)

Ottumwa Iron Works, Ottumwa, Ia.

Sanford-Day Iron Works, Knoxville, Tenn.

—Trailer

Baker Economic Transport Corp'n, 31 Nassau St., New York

Elwell-Parker Electric Co., Cleveland, O.

*HUNT CO., INC., C. W., West New Brighton, Staten Island, N. Y. . . pp. 252, 253

Menasha Wood Split Pulley Co., Menasha, Wis.

TUBE BENDING AND COILING MACHINES

American Pipe Bending Machine Co., 46 Pearl St., Boston, Mass.

Cox Engrg. & Tube Bending Machine Works, J. Fillmore, 681-687 Boulevard, Bayonne, N. J.

TUBE CLEANERS**—Boiler**

Bushnell & Co., John S., 146 Liberty St., New York

Chesterton Co., A. W., 64 India St., Boston, Mass.
Dallett Co., Thomas H., Broad & Federal Sts., Philadelphia, Pa.

General Specialty Co., 291-295 Michigan Ave., Buffalo, N. Y.

Lagonda Mfg. Co., Springfield, O.

Liberty Mfg. Co., 6900 Susquehanna St., Pittsburgh, Pa.

Manchester Mfg. Co., North Manchester, Ind.

Monarch Soot Remover Co., Inc., 261 Franklin St., Boston, Mass.

National Boiler Specialties Co., Elgin, Ill.

Pierce Co., Wm. B., 45 North Division St., Buffalo, N. Y.

Rosedale Foundry & Machine Co., Columbus & Freble Aves., Pittsburgh, Pa.

ROTO CO., Hartford, Conn. . . p. 71

Sherwood Mfg. Co., 1702-1712 Elmwood Ave., Buffalo, N. Y.

Thompson & Co., Richard, 126 Liberty St., New York

—Condenser

ROTO CO., Hartford, Conn. . . p. 71

—Economizer

ROTO CO., Hartford, Conn. . . p. 71

TUBE DRAWING MACHINERY

Richard Mfg. Co., Bloomsburg, Pa.

TUBE EXTRACTORS, BOILER

Robertson Co., John F., 1001 Park Bldg., Pittsburgh, Pa.

TUBE MILL COMPANY

LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373

PHOENIX IRON WORKS CO., Meadville, Pa. . . p. 497

TORRINGTON MFG. CO., Torrington, Conn. . . p. 483

—Seamless

Standard Engineering Co., Ellwood City, Pa.

TUBE ROLLING MACHINES

Bristol Machine Tool Co., Bristol, Conn.

TUBE TAPERING MACHINES

Torrington Co., Torrington, Conn.

TUBE WORKS EQUIPMENT

LANDIS MACHINE CO., INC., Waynesboro, Pa. . . pp. 372, 373

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J. . . p. 421

TORRINGTON MFG. CO., Torrington, Conn. . . p. 483

TUBES**—Ball and Roller Bearing**

Ohio Seamless Tube Co., Shelby, O.

—Boiler

Allegheny Steel Co., Pittsburgh, Pa.

MARK MFG. CO., P. O. Box G, Chicago, Ill. . . p. 160

National Tube Co. (National), Frick Bldg., Pittsburgh, Pa.

Parkeburg Iron Co., Parkeburg, Pa.

Reliance Tube Co., Ltd., 803 Second National

Bank Bldg., Pittsburgh, Pa.

South Chester Tube Co., Chester, Pa.

Standard Seamless Tube Co., Ambridge, Pa.

—Boiler (Charcoal Iron)

Parkeburg Iron Co., Parkeburg, Pa.

Reading Iron Co., Reading, Pa.

Tyler Tube & Pipe Co., Washington, Pa.

—Boiler (Ingot Iron)

MONONGAHELA TUBE CO., Pittsburgh, Pa. . . p. 70

—Boiler (Seamless Steel)

Detroit Seamless Steel Tubes Co., Detroit, Mich.

Pittsburgh Steel Products Co., Pittsburgh, Pa.

—Boiler (Soft Steel)

Tyler Tube & Pipe Co., Washington, Pa.

—Condenser

AMERICAN BRASS CO., Waterbury, Conn. . . p. 295

Baltimore Tube Co., Inc., Baltimore, Md.

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J. . . p. 116

—Evaporator

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J. . . p. 116

—Pneumatic Despatch

LAMSON CO., 100 Boylston St., Boston, Mass. . . pp. 254, 255

Miles Co., George, Winsted, Conn.

Universal Tube Co., 142-152 W. Ohio St., Chicago, Ill.

—Pyrometer

CARBORUNDUM CO., Niagara Falls, N. Y. . . p. 389

TUBING**—Alloy**

AMERICAN BRASS CO., Waterbury, Conn. . . p. 295

Ohio Seamless Tube Co., Shelby, O.

SANDUSKY FOUNDRY & MACHINE CO., Sandusky, O. . . p. 488

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J. . . p. 116

—Aluminum

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. . . p. 294

AMERICAN BRASS CO., Waterbury, Conn. . . p. 295

Bridgeport Brass Co., Bridgeport, Conn.

Ivins' Tube Works, Ellwood, Oak Lane Station, Philadelphia, Pa.

Rome Hollow Wire & Tube Co., Rome, N. Y.

—Bakelite

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . pp. 114, 115

—Bent and Swaged

American Tube Bending Co., New Haven, Conn.

—Brass and Copper

AMERICAN BRASS CO., Waterbury, Conn. . . p. 295

Baltimore Tube Co., Inc., Baltimore, Md.

RICHARDSON-PHOENIX CO., 126 Reservoir Ave., Milwaukee, Wis. . . pp. 170, 171

—Brass and Copper (Seamless)

AMERICAN BRASS CO., Waterbury, Conn. . . p. 295

Baltimore Tube Co., Inc., Baltimore, Md.

Chase Rolling Mill Co., Waterbury, Conn.

Erie-Buffalo Tube Co., Erie, Pa.

Tru

MacKenzie-Walton Co., Pawtucket, R. I.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rutter & Co., Arthur T., 256 Broadway, New York

SANDUSKY FOUNDRY & MACHINE CO., Sandusky, O., p. 488

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J., p. 116

—**Carburetor, Flexible Metal**

AMERICAN METAL HOSE CO., Waterbury, Conn., p. 184

—**Exhaust, Flexible Metal**

AMERICAN METAL HOSE CO., Waterbury, Conn., p. 184

—**Fibre**

AMERICAN VULCANIZED FIBRE CO., Wilmington, Del., p. 296

*CONTINENTAL FIBRE CO., Newark, Del., p. 297

*DIAMOND STATE FIBRE CO., Bridgeport, Pa., p. 298

—**Hard Rubber**

Stokes Rubber Co., Jos., Trenton, N. J.

—**Lead**

UNITED LEAD CO., 111 Broadway, New York, p. 299

—**Metal, Flexible**

Almond Mfg. Co., T. R., Ashburnham, Mass.

AMERICAN METAL HOSE CO., Waterbury, Conn., p. 184

Penna. Flexible Metallic Tubing Co., N. E. Cor. Broad & Race Sts., Philadelphia, Pa.

U. S. Flexible Metallic Tubing Co., Cor. Boyd & Omar Sts., Los Angeles, Cal.

White Dental Mfg. Co., S. S., 211 S. 12th St., Philadelphia, Pa.

—**Oil Well**

MARK MFG. CO., P. O. Box G, Chicago, Ill., p. 160

MONONGAHELA TUBE CO., Pittsburgh, Pa., p. 70

—**Rubber**

Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.

GOODRICH RUBBER CO., B. F., Akron, O., pp. 183, 242

Goshen Rubber & Mfg. Co., Goshen, Ind.

Hamilton Rubber Mfg. Co., Trenton, N. J.

—**Steel**

Phenix Tube Co., Brooklyn, N. Y.

MARK MFG. CO., P. O. Box G, Chicago, Ill., p. 160

MONONGAHELA TUBE CO., Pittsburgh, Pa., p. 70

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis., pp. 170, 171

Standard Parts Co., Edgewater Park, Cleveland, O.

—**Steel (Seamless)**

Blum & Co., Julius, 510-512 W. 24th St., New York

Detroit Seamless Steel Tubes Co., Detroit, Mich.

Ivins' Tube Works, Ellwood, Oak Lane Station, Philadelphia, Pa.

Lathaw Steel & Metal Products Corp'n, Spring City, Pa.

National Tube Co. (Shelby), Frick Bldg., Pittsburgh, Pa.

Pittsburgh Steel Products Co., Pittsburgh, Pa.

Standard Seamless Tube Co., Ambridge, Pa.

—**TUBING COILERS (Flexible Metal)**

SLEEPER & HARTLEY, INC., Worcester, Mass., p. 486

—**TUMBLING BARRELS**

—**Burnishing**

Abbott Ball Co., Elmwood, Conn.

American Foundry Equipment Co., 52 Vanderbilt Ave., New York

Baird Machine Co., Bridgeport, Conn.

Illinois Mfg. & Supply Co., Quincy, Ill.

Sly Mfg. Co., W. W., Cleveland, O.

—**Sand Blast**

*PANGBORN CORP'N, P. O. Box 859, Hagerstown, Md., pp. 460, 461

NEW HAVEN SAND BLAST CO., New Haven, Conn., p. 459

—**TURBINES**

—**Hydraulic**

*ALLIS-CHALMERS MFG. CO., Milwaukee, Wis., p. 15

*CRAMP & SONS SHIP & ENGINE BLDG. CO., WM. (I. P. Morris Dept.), Richmond & Norris Sts., Philadelphia, Pa., pp. 450, 451

Davis Foundry & Machine Works, Rome, Ga.

*HUNT MACHINE CO., RODNEY, Orange, Mass., p. 449

Holyoke Machine Co., Holyoke, Mass.

Hydraulic Turbine Corp'n, Camden, N. Y.

Jolly, Inc., J. & W., Holyoke, Mass.

*LEFFEL & CO., JAMES, Springfield, O., p. 453

Munson Mill Machinery Co., Inc., 405 Broadway, Utica, N. Y.

Smith Co., S. Morgan, York, Pa.

PELTON WATER WHEEL CO., Harrison & 19th Sts., San Francisco, Cal., p. 452

PLATT IRON WORKS, Dayton, O., p. 446

*POOLE ENGINEERING & MACHINE CO., Woodberry, Baltimore, Md., pp. 196, 197

Trump Mfg. Co., Springfield, O.

United Iron Works, Oakland, Cal.

WELLMAN-SEAEVER-MORGAN CO., 7000 Central Ave., Cleveland, O., p. 272

—**Steam**

*ALLIS-CHALMERS MFG. CO., Milwaukee, Wis., p. 15

COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass., pp. 76, 77

DE LAVAL STEAM TURBINE CO., Trenton, N. J., p. 22

*GENERAL ELECTRIC CO., Schenectady, N. Y., pp. 20, 21, 521

*GREEN FUEL ECONOMIZER CO., 90 West St., New York, p. 73

Hill Pump Co., Anderson, Ind.

Kerr Turbine Co., Wellsville, N. Y.

Moore Steam Turbine Corp'n, Wellsville, N. Y.

Platt & Co., John, 97 Cedar St., New York

Power Turbo Blower Co., 347 Madison Ave., New York

Rearick, Charles B., 14 Wall St., New York

Ridgway Dymaco & Engine Co., Ridgway, Pa.

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa., p. 456

Steam Motors Co., Inc., Springfield, Mass.

STURTEVANT CO., B. F., Hyde Park, Boston, Mass., pp. 74, 75

Terry Steam Turbine Co., Hartford, Conn.

Turbine Equipment Co., 50 Church St., New York

Vulcan Iron Works, Inc., Jersey City, N. J.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., pp. 114, 115

Wing Mfg. Co., L. J., 352 W. 13th St., New York

—**TURBO-BLOWERS**

COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass., pp. 76, 77

DE LAVAL STEAM TURBINE CO., Trenton, N. J., p. 22

Dominion Bridge Co., Ltd., Montreal, P. Q., Canada

*GENERAL ELECTRIC CO., Schenectady, N. Y., pp. 20, 21, 521

INGERSOLL-RAND CO., 11 Broadway, New York, pp. 428, 429

Moore Steam Turbine Corp'n, Wellsville, N. Y.

Power Turbo-Blower Co., 347 Madison Ave., New York

SOUTHWARK FOUNDRY & MACHINE CO., 400 Washington Ave., Philadelphia, Pa., p. 456

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., pp. 114, 115

Tur

TURBO-BLOWERS (Continued)

***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp.* 30, 117, 431, 447

TURBO-COMPRESSORS

DE LAVAL STEAM TURBINE CO., Trenton, N. J...*p.* 22

***GENERAL ELECTRIC CO.**, Schenectady, N. Y...*pp.* 20, 21, 521

INGERSOLL-RAND CO., 11 Broadway, New York...*pp.* 428, 429

Spencer Turbine Co., Hartford, Conn.

***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp.* 30, 117, 431, 447

TURBO-GENERATORS

DE LAVAL STEAM TURBINE CO., Trenton, N. J...*p.* 22

***GENERAL ELECTRIC CO.**, Schenectady, N. Y...*pp.* 20, 21, 521

Kerr Turbine Co., Wellsville, N. Y.

Moore Steam Turbine Corp'n, Wellsville, N. Y.

Ridgway Dynamo & Engine Co., Ridgway, Pa.

STURTEVANT CO., B. F., Hyde Park, Boston, Mass...*pp.* 74, 75

Terry Steam Turbine Co., Hartford, Conn.

***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa...*pp.* 114, 115

TURBO-PUMPS

COPPUS ENGINEERING & EQUIPMENT CO., Worcester, Mass...*pp.* 76, 77

DE LAVAL STEAM TURBINE CO., Trenton, N. J...*p.* 22

Moore Steam Turbine Corp'n, Wellsville, N. Y.

PLATT IRON WORKS, Dayton, O...*p.* 446

Rearick, Charles B., 14 Wall St., New York.

Terry Steam Turbine Co., Hartford Conn.

***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa...*pp.* 114, 115

WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p.* 116

Tur**TURNBUCKLES**

Cleveland City Forge & Iron Co., 45th St. & Lakeside Ave., Cleveland, O.

Merrill Bros., Mesepth N. Y.

Michigan Bolt & Nut Works, Detroit, Mich.

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York...*p.* 279

TURNABLES

American Bridge Co., 30 Church St., New York.

***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill...*p.* 256

TURRET HEADS (Bench Lathe)

McCROSKY REAMER CO., Meadville, Pa...*pp.* 380, 381

TURRET MACHINES

(See Lathes, Turret)

TWIST DRILL MAKING MACHINERY

Schweppe & Wilt Mfg. Co., Detroit, Mich.

TWIST DRILLS

(See Drills, Twist)

U**UNDERFEED STOKERS**

(See Stokers, Underfeed)

UNIONS

Athol Pump Co., Athol, Mass.

Bard Union Co., Inc., Norwich, Conn.

BUCKEYE IRON & BRASS WORKS, Dayton, O...*p.* 481

Eastwood Wire Mfg. Co., Belleville, N. J.

Illinois Malleable Iron Co. (Nokoros), Chicago, Ill.

Jefferson Union Co., Lexington, Mass.

McMann & Taylor Co. (Mantaco), 104-106 John St., New York

Rhode Island Fittings Co., Hills Grove, R. I.

Standard Union Co., 7 Water St., Boston, Mass.

Stoddard Union Co., Lockport, N. Y.

WILFERT CO., JOHN, 258 Broadway, New York...*pp.* 136, 137

WILLIAMS, INC., FRANKLIN (Tuxedo), 41 Courtlandt St., New York...*p.* 161

—Flange

***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y...*p.* 140

***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp.* 120, 121, 122, 123

Dart Mfg. Co., E. M., 136 Clifford St., Providence, R. I.

Eastwood Wire Mfg. Co., Belleville, N. J.

***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp.* 132, 133

SIMMONS CO., JOHN, 110 Center St., New York...*p.* 515

Stoddard Union Co., Lockport, N. Y.

WATSON-STILLMAN CO., 35 Church St., New York...*p.* 457

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...*p.* 397

—Pressed Steel

MARK MFG. CO., P. O. Box G, Chicago, Ill...*p.* 160

Rockwood Sprinkler Co. of Mass., 34-35 Harlow St., Worcester, Mass.

—Tubing

Nelson Mfg. Co., A., 564 W. Randolph St., Chicago, Ill.

UNLOADERS**—Air Compressor**

INGERSOLL-RAND CO., 11 Broadway, New York...*pp.* 428, 429

NORWALK IRON WORKS CO., So. Norwalk, Conn...*p.* 427

WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa...*pp.* 432, 433

***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp.* 30, 117, 431, 447

***VARNALL WARING CO.** (Varway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa...*p.* 139

—Portable

BROWN PORTABLE CONVEYING MACHINERY CO., Chicago, Ill...*p.* 262

***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill...*p.* 256

PORTABLE MACHINERY CO., INC., Passaic, N. J...*p.* 263

—Portable (Vessel)

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O...*p.* 272

UPSETTING MACHINES

Ajax Mfg. Co., 3830 Lakeside Ave., Cleveland, O.

NILES-BEMENT-POND CO., 111 Broadway, New York...*p.* 344

—Tire (With Punch and Shears)

Luther Mfg. Co., Olean, N. Y.

V**VACUUM BREAKERS**

Consolidated Engine Stop Co., 350 W. 38th St., New York

Morton Vacuum Breaker Co., Hyde Park, Boston, Mass.

Wood, Robert, 15 Hawthorne St., Brooklyn, N. Y.

VACUUM CLEANING MACHINERY

American Radiator Co., 816-822 S. Michigan Ave., Chicago, Ill.

Blaisdell Machinery Co., Bradford, Pa.

Monarch Vacuum Specialties Corp'n, 1161-1175 Broadway, New York

Spencer Turbine Co., Hartford, Conn.

VACUUM DRYERS, HEATING SYSTEMS, PANS, PUMPS, TRAPS, ETC.

(See Dryers, Heating Systems, Pans, Pumps, Traps, etc., Vacuum)

VACUUM DRYING APPARATUS

Buffalo Foundry & Machine Co., E. Perry St. & Fillmore Ave., Buffalo, N. Y.
Devine Co., J. P., 1372 Clinton St., Buffalo, N. Y.

SWENSON EVAPORATOR CO., 945 Monadnock Block, Chicago, Ill... *p. 501*

VACUUM HEADS (For Ingot Molds)

Peyton & Hitt, 426 W. 3rd St., Elyria, O.

VALVE BALLS

AUBURN BALL BEARING CO., 22 Elizabeth St., Rochester, N. Y... *p. 215*

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... *p. 124*

GOODRICH RUBBER CO., B. F., Akron, O... *pp. 183, 242*

MARK MFG. CO., P. O. Box G, Chicago, Ill... *p. 160*

VALVE BOXES

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... *p. 124*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

VALVE CHAMBERS REBORED

Hartford Engine Works, 223 State St., Hartford, Conn.

VALVE CHESTS, UNIVERSAL (Locomotive)

Economy Devices Corp'n, 30 Church St., New York

Franklin Railway Supply Co., 30 Church St., New York

VALVE CUPS

Schenck Mfg. & Supply Co., Parkers Landing, Pa.

VALVE INSERTING MACHINES (Water)

Smith Mfg. Co., A. P., East Orange, N. J.

VALVE RESEATING MACHINES

Leavitt Machine Co., Orange, Mass.
Skinner Co., M. B., 558-562 Washington Boul., Chicago, Ill.

VALVE STEMS (Gas Engine)

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... *p. 397*

VALVES**—Acid**

Cadman Mfg. Co., A. W., 2814 Smallman St., Pittsburgh, Pa.

Chemical Pump & Valve Co., 327 Gifford St., Perth Amboy, N. J.

Cleveland Brass Mfg. Co., 4606 Hamilton Ave., Cleveland, O.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... *p. 124*

Eastwood Wire Mfg. Co., Belleville, N. J.

Everlasting Valve Co., 2 Rector St., New York

*HOMESTEAD VALVE MFG. CO., P. O. Box 1754, Pittsburgh, Pa... *p. 126*

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

Lippold Valve Co., Erie, Pa.

Ludlow Valve Mfg. Co., Troy, N. Y.

Monarch Mfg. Works, 3130 Emery St., Philadelphia, Pa.

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

UNITED LEAD CO., 111 Broadway, New York... *p. 299*

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

—Air (Automatic)

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*

Hall Steam Pump Co., Pittsburgh, Pa.

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

Magee Valve Co., Inc., 136 Beekman St., New York

Marsh & Co., James P., 118 S. Clinton St., Chicago, Ill.

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p. 496*

Monash-Younker Co., 1407 W. Jackson Blvd., Chicago, Ill.

National Steam Specialty Co., 12 S. Clinton St., Chicago, Ill.

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

*SMITH CO., H. B., Westfield, Mass... *pp. 478, 479*

—Air Operating

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... *p. 124*

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p. 496*

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

WESTINGHOUSE TRACTION BRAKE CO., Wilmerding, Pa... *pp. 432, 433*

—Air Relief

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... *p. 526*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... *p. 124*

FORD CO., THOMAS P., 407 Broome St., New York... *p. 125*

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... *pp. 127, 528*

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p. 496*

MORRISON BROS., Dubuque, Ia... *p. 495*

STEPHENS MFG. CO., ROE, Detroit, Mich... *p. 138*

WEBSTER & CO., WARREN, Camden, N. J... *pp. 108, 109, 110*

—Altitude

Chaplin-Fulton Mfg. Co., 28 Penn Ave., Pittsburgh, Pa.

KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*

Simplex Valve & Meter Co., 625 Wood St., Philadelphia, Pa.

—Ammonia

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... *p. 526*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*

*DE LA VERGNE MACHINE CO., 1123 E. 138th St., New York... *p. 28*

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa... *pp. 127, 528*

PRATT & CADY CO., INC., Hartford, Conn... *pp. 134, 135*

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Val

See Catalogue Section for data of firms listed in capital type

VALVES (Continued)**—Ammonia**

Universal Valve Co., Burlington, Wis.
 *VILTER MFG. CO., 1194-1196 Clinton St., Milwaukee, Wis... *p. 18*
 VOGT MACHINE CO., HENRY, Louisville, Ky... *p. 63*
 WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*
 York Mfg. Co., York, Pa.

—Automatic Cut-Off (Gas)

Oven Equipment & Mfg. Co., New Haven, Conn.

—Back Pressure

Boylston Steam Specialty Co., 116-122 Illinois St., Chicago, Ill.
 Connelly Iron Sponge & Governor Co., 227 Fulton St., New York
 *CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*
 CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*
 Fisher Governor Co., Marshalltown, Iowa
 HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... *pp. 104, 105*

Illinois Engineering Co., Racine at 21st St., Chicago, Ill.

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*

Klipfel Mfg. Co., 2651 W. Harris St., Chicago, Ill.

Konold Co., M. J., 602 Bessemer Bldg., Pittsburgh, Pa.

McGowan Co., John H., Cincinnati, O.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

PRATT & CADY CO., INC., Hartford, Conn... *pp. 134, 135*

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

—Balanced

American Balance Valve Co., Jersey Shore, Pa.

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

Baker Valve Co., Box 1772, Minneapolis, Minn.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

*HOMESTEAD VALVE MFG. CO., P. O. Box 1754, Pittsburgh, Pa... *p. 126*

KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*

Konold Co., M. J., 602 Bessemer Bldg., Pittsburgh, Pa.

Lewis Steam Specialty & Valve Co., 2218-24 Vine St., Philadelphia, Pa.

Nason Mfg. Co., 71 Fulton St., New York

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

STEPHENS MFG. CO., ROE, Detroit, Mich... *p. 138*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

—Ball

American Ball Valve & Mfg. Co., 572 Franklin St., Detroit, Mich.

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y... *p. 140*

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... *p. 124*

Farrell Valve & Specialty Co., Room 9, 110 Franklin St., Buffalo, N. Y.

—Blowoff

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass... *p. 526*

Bashlin Co., Warren, Pa.

Cadman Mfg. Co., A. W., 2814 Smallman St., Pittsburgh, Pa.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*

Eastwood Wire Mfg. Co., Belleville, N. J.

Edward Valve & Mfg. Co., 72 W. Adams St., Chicago, Ill.

Everlasting Valve Co., 2 Rector St., New York

*HOMESTEAD VALVE MFG. CO., P. O. Box 1754, Pittsburgh, Pa... *p. 126*

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

Liberty Mfg. Co., 6900 Susquehanna St., Pittsburgh, Pa.

Ludlow Valve Mfg. Co., Troy, N. Y.

National Boiler Specialties Co., Elgin, Ill.

Ohio Injector Co., S. Main St., Wadsworth, O.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

PRATT & CADY CO., INC., Hartford, Conn... *pp. 134, 135*

RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

Sargent Co., 625 W. Jackson Blvd., Chicago, Ill.

Scully Steel & Iron Co. (Everlasting), P. O. Box 814, Chicago, Ill.

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Steam Appliance Co., West Allis, Wis.

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... *p. 535*

Vance-Vetter Co., Phipps Power Bldg., Pittsburgh, Pa.

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

*YARNALL-WARING CO. (Yarway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa... *p. 139*

—Butterfly

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa... *p. 496*

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

—Check

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass... *pp. 142, 143*

American Valve Co., Cossackie, N. Y.

Bashlin Co., Warren, Pa.

BUCKEYE IRON & BRASS WORKS, Dayton, O... *p. 481*

Chapman Valve Mfg. Co., Indian Orchard, Mass.

Coffin Valve Co., Neponset, Mass.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass... *p. 527*

DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... *p. 124*

Eddy Valve Co., Watford, N. Y.

*GREENE, TWEED & CO., 109 Duane St., New York... *p. 168*

Hennebelle Co., F., 81st St. & S. Chicago Ave., S. Chicago, Ill.

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

Lippold Valve Co., Erie, Pa.

Ludlow Valve Mfg. Co., Troy, N. Y.

Nelson Valve Co., Chestnut Hill, Philadelphia, Pa.

PENBERTHY INJECTOR CO., Detroit, Mich... *pp. 152, 153*

Val

MECHANICAL EQUIPMENT DIRECTORY

***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*
PRATT & CADY CO., INC., Hartford, Conn...*pp. 134, 135*
RICHARDSON-PHENIX CO., 126 Reservoir Ave., Milwaukee, Wis...*pp. 170, 171*
SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*
STEPHENS MFG. CO., ROE, Detroit, Mich...*p. 138*
WILFERT CO., JOHN, 258 Broadway, New York...*pp. 136, 137*
WOOD & CO., R. D., Philadelphia, Pa...*p. 458*
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp. 30, 117, 431, 447*
—Chronometer
 Union Water Meter Co., 33 Hermon St., Worcester, Mass.
—Diaphragm
 Johnson Service Co., Milwaukee, Wis.
—Drifting
 Coale Muffler & Safety Valve Co. (Riggin), 325 E. Oliver St., Baltimore, Md.
—Dry Pipe (Sprinkler)
 Globe Automatic Sprinkler Co., 2035 Washington Ave., Philadelphia, Pa.
—Electrically Operated
 Ludlow Valve Mfg. Co., Troy, N. Y.
***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*
—Exhaust Relief
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*
 Davis Regulator Co., G. M., 422 Milwaukee Ave., Chicago, Ill.
 Fisher Governor Co., Marshalltown, Iowa
HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa...*pp. 104, 105*
***JENKINS BROS.**, 80 White St., New York *pp. 128, 129*
KIELEY & MUELLER, INC., 34 W. 13th St., New York...*p. 146*
***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*
WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J...*p. 116*
—Float
AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass...*pp. 142, 143*
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*
 Fisher Governor Co., Marshalltown, Iowa
FORD CO., THOMAS P., 407 Broome St., New York...*p. 125*
 Golden-Anderson Valve Specialty Co., 1002 Fulton Bldg., Pittsburgh, Pa.
***HOMESTEAD VALVE MFG. CO.**, P. O. Box 1754, Pittsburgh, Pa...*p. 126*
KIELEY & MUELLER, INC., 34 W. 13th St., New York...*p. 146*
 Lewis Steam Specialty & Valve Co., 2218-24 Vine St., Philadelphia, Pa.
 Ludlow Valve Mfg. Co., Troy, N. Y.
 Peerless Engineering Co., 1253 First Natl. Bank Bldg., Chicago, Ill.
***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*
 Schade Valve Mfg. Co., 2542 N. American St., Philadelphia, Pa.
SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*
—Foot
 Coffin Valve Co., Neponset, Mass.
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*
 Emerson Pump & Valve Co., Inc., Alexandria, Va.
 Ludlow Valve Mfg. Co., Troy, N. Y.
MORRISON BROS., Dubuque, Ia...*p. 495*
 Newman Mfg. Co., 79 Barclay St., New York
PENBERTHY INJECTOR CO., Detroit, Mich...*pp. 152, 153*
***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*

SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*
WOOD & CO., R. D., Philadelphia, Pa...*p. 458*
***WORTHINGTON PUMP & MACHINERY CORP'N**, 115 Broadway, New York...*pp. 30, 117, 431, 447*
—Foot (Gas Shut-Off)
WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O...*p. 272*
—Gate
***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y...*p. 140*
 American Valve Co., Cossackie, N. Y.
 California Corrugated Culvert Co., West Berkeley, Cal.
 Chapman Valve Mfg. Co., Indian Orchard, Mass.
 Coffin Valve Co., Neponset, Mass.
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*
DARLING PUMP & MFG. CO., LTD., Williamsport, Pa...*p. 124*
DOLE VALVE CO., 208 N. Wells St., Chicago, Ill...*p. 141*
 Eddy Valve Co., Waterford, N. Y.
 Farrell Valve & Specialty Co., Room 9, 110 Franklin St., Buffalo, N. Y.
***HUNT MACHINE CO., RODNEY**, Orange, Mass...*p. 449*
 Isbell-Porter Co., 46 Bridge St., Newark, N. J.
***JENKINS BROS.**, 80 White St., New York *pp. 128, 129*
KELLY & JONES CO., Greensburg, Pa...*pp. 130, 131*
 Kennedy Valve Mfg. Co., Elmira, N. Y.
 Ludlow Valve Mfg. Co., Troy, N. Y.
 McMann & Taylor Co., 104-106 John St., New York
 McNab & Harlin Mfg. Co., Paterson, N. J.
 Marsh Valve Co., Erie, Pa.
MARSHALL FOUNDRY CO., 1st Natl. Bank Bldg., Pittsburgh, Pa...*p. 496*
 Milwaukee Valve Co., 139 Burrell St., Milwaukee, Wis.
 National Supply Co., 136 Huron St., Toledo, O.
 Nelson Valve Co., Chestnut Hill, Philadelphia, Pa.
 Ohio Injector Co., S. Main St., Wadsworth, Ohio
 Pittsburgh Valve & Fittings Co., Barberton, O.
***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*
PRATT & CADY CO., INC., Hartford, Conn...*pp. 134, 135*
 Rennselaer Valve Co., Troy, N. Y.
SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*
 Smith Mfg. Co., A. P., East Orange, N. J.
STEPHENS MFG. CO., ROE, Detroit, Mich...*p. 138*
 Sturgis Machine Co., Sturgis, Mich.
 Walworth Mfg. Co., First & O. Sts., South Boston, Mass.
 Western Gas Construction Co., Fort Wayne, Ind.
WILFERT CO., JOHN, 258 Broadway, New York...*pp. 136, 137*
WOOD & CO., R. D., Philadelphia, Pa...*p. 458*
—Globe, Angle and Cross
 American Ball Valve & Mfg. Co., 572 Franklin St., Detroit, Mich.
AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass...*pp. 142, 143*
 American Valve Co., Cossackie, N. Y.
 Bashlin Co., Warren, Pa.
 Bayer Valve Co., 2828 La Salle St., St. Louis, Mo.
 Belfield Co., H., 435 N. Broad St., Philadelphia, Pa.
BUCKEYE IRON & BRASS WORKS, Dayton, O...*p. 481*
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*

Val

VALVES (Continued)**—Globe, Angle and Cross**

CROSBY STEAM GAGE & VALVE CO., 40
Central St., Boston, Mass... *p. 527*

Detroit Brass Works, 99 Hobart Ave., Detroit,
Mich.

DOLE VALVE CO., 208 N. Wells St., Chicago,
Ill... *p. 141*

Fairbanks Co., 416-422 N. Fifth Ave., Chicago,
Ill.

Farrell Valve & Specialty Co., Room 9, 110
Franklin St., Buffalo, N. Y.

Hancock Inspirator Co., 119 W. 40th St., New
York

Jarecki Mfg. Co., Erie, Pa.

*JENKINS BROS., 80 White St., New York
... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

Kennedy Valve Mfg. Co., Elmira, N. Y.

Lippold Valve Co., Erie, Pa.

McMann & Taylor Co., 104-106 John St.,
New York

McNab & Harlin Mfg. Co., Paterson, N. J.

McRae & Roberts Co., Detroit, Mich.

Marsh Valve Co., Erie, Pa.

Milwaukee Valve Co., 139 Burrell St., Mil-
waukee, Wis.

Nelson Valve Co., Chestnut Hill, Philadelphia,
Pa.

Ohio Brass Co., Mansfield, O.

Ohio Injector Co., S. Main St., Wadsworth, O.

PENBERTHY INJECTOR CO., Detroit, Mich.
... *pp. 152, 153*

Pittsburgh Valve & Fittings Co., Barberton, O.

*PITTSBURGH VALVE, FOUNDRY &
CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

Powell Co., William, Cincinnati, O.

PRATT & CADY CO., INC., Hartford, Conn.
... *pp. 134, 135*

RICHARDSON-PHENIX CO. (Nokut), 126
Reservoir Ave., Milwaukee, Wis... *pp. 170, 171*

SIMMONS CO., JOHN, 110 Center St., New
York... *p. 515*

Star Brass Mfg. Co., 108 E. Dedham St., Boston,
Mass.

STEPHENS MFG. CO., ROE, Detroit, Mich.
... *p. 138*

Universal Valve Co., Burlington, Wis.

WILFERT CO., JOHN, 258 Broadway, New
York... *pp. 136, 137*

Williams Valve Co., D. T., Cincinnati, O.

—Hose

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp. 120, 121, 122, 123*

DARLING PUMP & MFG. CO., LTD., Wil-
liamsport, Pa... *p. 124*

*JENKINS BROS., 80 White St., New York...
pp. 128, 129

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

Ludlow Valve Mfg. Co., Troy, N. Y.

PRATT & CADY CO., INC., Hartford, Conn.
... *pp. 134, 135*

STEPHENS MFG. CO., ROE, Detroit, Mich.
... *p. 138*

—Hydraulic

*ASHTON VALVE CO., 161 First St., Cam-
bridge, Boston, Mass... *p. 526*

BURROUGHS CO., CHARLES, Newark, N. J.
... *p. 454*

Cadman Mfg. Co., A. W., 2814 Smallman St.,
Pittsburgh, Pa.

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40
Central St., Boston, Mass... *p. 527*

DARLING PUMP & MFG. CO., LTD., Wil-
liamsport, Pa... *p. 124*

Eastern Machinery & Equipment Co., Inc.,
1036 Commercial Trust Bldg., Philadelphia,
Pa.

Hennebelle Co., F., 81st St. & S. Chicago Ave.,
Chicago, Ill.

*HOMESTEAD VALVE MFG. CO., P. O.
Box 1754, Pittsburgh, Pa... *p. 126*

Hydraulic Press Mfg. Co., Mount Gilead,
Ohio

*JENKINS BROS., 80 White St., New York
... *pp. 128, 129*

Larner Johnson Valve & Engrg. Co., Widener
Bldg., Philadelphia, Pa.

*PITTSBURGH VALVE, FOUNDRY &
CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

PRATT & CADY CO., INC., Hartford, Conn.
... *pp. 124, 135*

SOUTHWARK FOUNDRY & MACHINE CO.,
400 Washington Ave., Philadelphia, Pa... *p. 456*

Utility Mfg. Co., Cudahy, Wis.

VOGT MACHINE CO., HENRY, Louisville,
Ky... *p. 63*

WATSON-STILLMAN CO., 35 Church St.,
New York... *p. 457*

WILFERT CO., JOHN, 258 Broadway, New
York... *pp. 136, 137*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

*YARNALL-WARING CO. (Yarway), Chestnut
Hill, 7603-20 Queen St., Philadelphia, Pa.
... *p. 139*

—Hydraulic Operating

BURROUGHS CO., CHARLES, Newark, N. J.
... *p. 454*

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp. 120, 121, 122, 123*

DARLING PUMP & MFG. CO., LTD., Wil-
liamsport, Pa... *p. 124*

GALLAND-HENNING MFG. CO., 26th-27th
Ave. & Layton Park, Milwaukee, Wis... *p. 455*

Hennebelle Co., F., 81st St. & S. Chicago Ave.,
S. Chicago, Ill.

*JENKINS BROS., 80 White St., New York
... *pp. 128, 129*

Ludlow Valve Mfg. Co., Troy, N. Y.

*PITTSBURGH VALVE, FOUNDRY &
CONST. CO., Pittsburgh, Pa... *pp. 132, 133*

PRATT & CADY CO., INC., Hartford, Conn.
... *pp. 134, 135*

Sterrit-Thomas Foundry Co., 32nd & Smallman
Sts., Pittsburgh, Pa.

WATSON-STILLMAN CO., 35 Church St.,
New York... *p. 457*

WELLMAN SEEVER-MORGAN CO., 7000
Central Ave., Cleveland, O... *p. 272*

WOOD & CO., R. D., Philadelphia, Pa... *p. 458*

*YARNALL-WARING CO. (Yarway), Chestnut
Hill, 7603-20 Queen St., Philadelphia, Pa... *p. 139*

—Hydraulic Penstock

WELLMAN-SEEVER-MORGAN CO., 7000
Central Ave., Cleveland, O... *p. 272*

—Locomotive Blower

Coale Muffler & Safety Valve Co. (Riggin), 325
E. Oliver St., Baltimore, Md.

Everlasting Valve Co., 2 Rector St., New York

—Non-Return

Acton, John, 118 John St., Brooklyn, N. Y.

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40
Central Ave., Cleveland, O... *p. 527*

Davis Regulator Co., G. M., 422 Milwaukee
Ave., Chicago, Ill.

Edward Valve & Mfg. Co., 72 W. Adams St.,
Chicago, Ill.

FORD CO., THOMAS P., 407 Broome St.,
New York... *p. 125*

Golden-Anderson Valve Specialty Co., 1002
Fulton Bldg., Pittsburgh, Pa.

Illinois Engineering Co., Racine at 21st St.,
Chicago, Ill.

*JENKINS BROS., 80 White St., New York
... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

KIELEY & MUELLER, INC., 34 W. 13th St.,
New York... *p. 146*

Lagonda Mfg. Co., Springfield, O.

Lunkenheimer Co., Cincinnati, O.

Nelson Valve Co., Chestnut Hill, Philadelphia, Pa.

Val

***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*
PRATT & CADY CO., INC., Hartford, Conn...*pp. 134, 135*
Ruggles-Klingham Mfg. Co., 10 High St., Boston, Mass.
SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*
Strong, Carlisle & Hammond Co., Cleveland, O.
—Oil-Firing
HAMMEL OIL BURNING EQUIPMENT CO., 409 Pine St., Providence, R. I...*p. 95*
—Pilot
Judson Governor Co., Rochester, N. Y.
—Piston
American Balance Valve Co., Jersey Shore, Pa.
KELLY & JONES CO., Greensburg, Pa...*pp. 130, 131*
—Plug
American Balance Valve Co., Jersey Shore, Pa.
Cadman Mfg. Co., A. W., 2814 Smallman St., Pittsburgh, Pa.
Gorton & Lidgerwood Co., 96 Liberty St., New York
***HOMESTEAD VALVE MFG. CO.**, P. O. Box 1754, Pittsburgh, Pa...*p. 126*
KELLY & JONES CO., Greensburg, Pa...*pp. 130, 131*
***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*
PRATT & CADY CO., INC., Hartford, Conn...*pp. 134, 135*
SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*
—Pop Safety
AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass...*pp. 142, 143*
***ASHTON VALVE CO.**, 161 First St., Cambridge, Boston, Mass...*p. 526*
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*
CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass...*p. 528*
DETROIT LUBRICATOR CO., Detroit, Mich...*p. 167*
KELLY & JONES CO., Greensburg, Pa...*pp. 130, 131*
Kunkle Valve Co., Fort Wayne, Ind.
LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa...*pp. 127, 128*
STEPHENS MFG. CO., ROE, Detroit, Mich...*p. 138*
—Pump
American Ball Valve & Mfg. Co., 572 Franklin St., Detroit, Mich.
AMERICAN VULCANIZED FIBRE CO., Wilmington, Del...*p. 296*
Birch Hintz Mfg. Co., 1100-1110 S. Kilbourn Ave., Chicago, Ill.
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Dick, Ltd., R. & J., Passaic, N. J.
Excelsior Valve Co., 106-108 Fulton St., New York
Federal Metallic Packing Co., 48 Hanover St., Boston, Mass.
Hill Pump Valve Co., Archer Ave., Canal & 23rd Sts., Chicago, Ill.
***JENKINS BROS.**, 80 White St., New York...*pp. 128, 129*
***JOHNS-MANVILLE CO.**, H. W., 296 Madison Ave., New York...*p. 162*
KELLY & JONES CO., Greensburg, Pa...*pp. 130, 131*
La Favorite Rubber Mfg. Co., Paterson, N. J.
Lake Erie Mfg. Co., 192 Chicago St., Buffalo, N. Y.
N. J. Car Spring & Rubber Co., Jersey City, N. J.
Quaker City Rubber Co., 629 Market St., Philadelphia, Pa.
U. S. Indestructible Gasket Co., 50 Church St., New York

—Radiator

***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y...*p. 140*
Bishop & Bacock Co., E. 40th & Hamilton Ave., Cleveland, Ohio
BUCKEYE IRON & BRASS WORKS, Dayton, O...*p. 481*
Commonwealth Brass Corp'n (Standard), Commonwealth Ave. & Grand Trunk Ry., Detroit, Mich.
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*
DETROIT LUBRICATOR CO., Detroit, Mich...*p. 167*
DOLE VALVE CO., 208 N. Wells St., Chicago, Ill...*p. 141*
Gorton & Lidgerwood Co., 96 Liberty St., New York
***JENKINS BROS.**, 80 White St., New York...*pp. 128, 129*
***JOHNS-MANVILLE CO.**, H. W., 296 Madison Ave., New York...*p. 162*
KELLY & JONES CO., Greensburg, Pa...*pp. 130, 131*
Magee Valve Co., Inc., 136 Beekman St., New York
Marsh Valve Co., Erie, Pa.
Michigan Lubricator Co., 661 Beaubien St., Detroit, Mich.
Milwaukee Valve Co., 139 Burrell St., Milwaukee, Wis.
Ohio Injector Co., S. Main St., Wadsworth, O.
PRATT & CADY CO., INC., Hartford, Conn...*pp. 134, 135*
SIMMONS CO., JOHN, 110 Center St., New York...*p. 515*
STEPHENS MFG. CO., ROE, Detroit, Mich...*p. 138*
WEBSTER & CO., WARREN, Camden, N. J...*pp. 108, 109, 110*
—Reducing
***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y...*p. 140*
Atlas Valve Co., Inc., 90 West St., New York
Belfield Co., H., 435 N. Broad St., Philadelphia, Pa.
Boylston Steam Specialty Co., 116-122 W. Illinois St., Chicago, Ill.
Cash Co., A. W., Decatur, Ill.
Chaplin-Fulton Mfg. Co., 28 Penn Ave., Pittsburgh, Pa.
***CRANE CO.**, 836 S. Michigan Ave., Chicago, Ill...*pp. 120, 121, 122, 123*
Davis Regulator Co., G. M., 422 Milwaukee Ave., Chicago, Ill.
D'ESTE JULIAN, 26 Canal St., Boston, Mass...*p. 144*
Dunham Co., C. A., 1710 Fisher Bldg., Chicago, Ill.
Fisher Governor Co., Marshalltown, Iowa
FORD CO., THOMAS P., 407 Broome St., New York...*p. 125*
IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J...*p. 145*
***JENKINS BROS.**, 80 White St., New York...*pp. 128, 129*
Johnson Service Co., Milwaukee, Wis.
KELLY & JONES CO., Greensburg, Pa...*pp. 130, 131*
KIELEY & MUELLER, INC., 34 W. 13th New York...*p. 146*
LESLIE CO., Lyndhurst, N. J...*p. 147*
Locke Regulator Co., Salem, Mass.
Lytton Mfg. Corp'n, Franklin, Va.
Mason Regulator Co., Boston, Mass.
***PITTSBURGH VALVE, FOUNDRY & CONST. CO.**, Pittsburgh, Pa...*pp. 132, 133*
Schade Valve Mfg. Co., 2542 N. American St., Philadelphia, Pa.
Squires Co., C. E., E. 40th St. & Kelley Ave., Cleveland, O.
TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y...*p. 535*
Waters Governor Co., 1122 Oliver Bldg., Boston, Mass.
Watson & McDaniel Co., 142 N. 7th St., Philadelphia, Pa.

Val

VALVES (Continued)**—Reducing**

Western Kieley Steam Specialty Co., 116-122 W. Illinois St., Chicago, Ill.
 WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

—Regulating

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y.... *p. 140*
 AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass.... *pp. 142, 143*
 Belfield Co., H., 435 N. Broad St., Philadelphia, Pa.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill.... *pp. 120, 121, 122, 123*
 D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass.... *p. 144*

Dorn & Marcellus Co., Kinsey & Hedge Sts., Philadelphia, Pa.

FORD CO., THOMAS P., 407 Broome St., New York... *p. 125*

Foster Engineering Co., Newark, N. J.
 Golden-Anderson Valve Specialty Co., 1002 Fulton Bldg., Pittsburgh, Pa.

Hagan Corp'n, 401 Peoples Bank Bldg., Pittsburgh, Pa.

IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J.... *p. 145*

Illinois Engineering Co., Racine at 21st St., Chicago, Ill.

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa.... *pp. 130, 131*

KIELEY & MUELLER, INC., 34 W. 13th St., New York... *p. 146*

LESLIE CO., Lyndhurst, N. J.... *p. 147*
 Northern Equipment Co., Erie, Pa.

Ross Valve Mfg. Co., Troy, N. Y.
 Schade Valve Mfg. Co., 2542 N. American St., Philadelphia, Pa.

Western Kieley Steam Specialty Co., 116-122 W. Illinois St., Chicago, Ill.

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

WILLIAMS, INC., FRANKLIN, 41 Cortlandt St., New York... *p. 161*

—Relief (Water)

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass.... *p. 526*

Cash Co., A. W., Decatur, Ill.

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill.... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass.... *p. 527*

FORD CO., THOMAS P., 407 Broome St., New York... *p. 125*

IDEAL AUTOMATIC GOVERNOR CO., 164 Emmet St., Newark, N. J.... *p. 145*

Kunkle Valve Co., Fort Wayne, Ind.

LONERGAN CO., J. E., 211-215 Race St., Philadelphia, Pa.... *pp. 127, 528*

MORRISON BROS., Dubuque, Ia.... *p. 495*

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa.... *pp. 132, 133*

STEPHENS MFG. CO., ROE, Detroit, Mich.... *p. 138*

Triumph Valve Mfg. Co., P. O. Box 327, Mansfield, O.

WOOD & CO., R. D., Philadelphia, Pa.... *p. 458*

—Reversing (Furnace)

Blair Engineering Co., 17 Battery Place, New York

BLAW-KNOX CO. (Knox), Pittsburgh, Pa.... *p. 489*

WELLMAN-SEEVER-MORGAN CO., 7000 Central Ave., Cleveland, O.... *p. 272*

—Rubber

GOODRICH RUBBER CO., B. F., Akron, O.... *pp. 183, 242*

Hamilton Rubber Mfg. Co., Trenton, N. J.

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

Knowlton Rubber Co., G. W., 60 Pearl St., Boston, Mass.

—Safety

*AMERICAN DISTRICT STEAM CO., North Tonawanda, N. Y.... *p. 140*

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass.... *pp. 142, 143*

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass.... *p. 526*

Coale Muffler & Safety Valve Co., 325 E. Oliver St., Baltimore, Md.

Consolidated Safety Valve Co., 119 W. 40th St., New York

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill.... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass.... *p. 527*

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa.... *pp. 130, 131*

Star Brass Mfg. Co., 108 E. Dedham St., Boston, Mass.

Triumph Valve Mfg. Co., P. O. Box 327, Mansfield, O.

—Stop and Check

(See Valves, Non-Return)

—Superheated Steam (Steel)

*ASHTON VALVE CO., 161 First St., Cambridge, Boston, Mass.... *p. 526*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill.... *pp. 120, 121, 122, 123*

D'ESTE CO., JULIAN, 26 Canal St., Boston, Mass.... *p. 144*

Edward Valve & Mfg. Co., 72 W. Adams St., Chicago, Ill.

*HOMESTEAD VALVE MFG. CO., P. O. Box 1754, Pittsburgh, Pa.... *p. 126*

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa.... *pp. 130, 131*

National Valve & Mfg. Co., Pittsburgh, Pa.

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa.... *pp. 132, 133*

PRATT & CADY CO., INC., Hartford, Conn.... *pp. 134, 135*

RICHARDSON-PHENIX CO., 128 Reservoir Ave., Milwaukee, Wis.... *pp. 170, 171*

VOGT MACHINE CO., HENRY, Louisville, Ky.... *p. 63*

WILFERT CO., JOHN, 258 Broadway, New York... *pp. 136, 137*

—Throttle

Bay City Foundry & Machine Co. (Pendry Balanced), 26th & Water Sts., Bay City, Mich.

BUCKEYE IRON & BRASS WORKS, Dayton, O.... *p. 481*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill.... *pp. 120, 121, 122, 123*

CROSBY STEAM GAGE & VALVE CO., 40 Central St., Boston, Mass.... *p. 527*

DETROIT LUBRICATOR CO., Detroit, Mich.... *p. 167*

FLORY MFG. CO., S., Bangor, Pa.... *p. 269*

*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa.... *pp. 130, 131*

*PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa.... *pp. 132, 133*

Schutte & Koerting Co., 12th & Thompson Sts., Philadelphia, Pa.

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

STEPHENS MFG. CO., ROE, Detroit, Mich.... *p. 138*

—Trap

AMERICAN STEAM GAUGE & VALVE MFG. CO., Boston, Mass.... *pp. 142, 143*

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill.... *pp. 120, 121, 122, 123*

—Vacuum-Heating

Bishop & Babcock Co., E. 49th & Hamilton Ave., Cleveland, Ohio

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill.... *pp. 120, 121, 122, 123*

Val

D. G. C. Trap & Valve Co., 18 E. 41st St., New York
DOLE VALVE CO., 208 N. Wells St., Chicago, Ill... *p. 141*

Donnelly Systems Co., 9 Murray St., New York
*JENKINS BROS., 80 White St., New York... *pp. 128, 129*

KELLY & JONES CO., Greensburg, Pa... *pp. 130, 131*

Monash-Younger Co., 1407 W. Jackson Blvd., Chicago, Ill.

Open Coil Heater & Purifier Co., Indianapolis, Ind.

Peerless Engineering Co., 1253 First Natl. Bank Bldg., Chicago, Ill.

Positive Differential System Co., 9 Murray St., New York

*SARCO CO., INC., Woolworth Bldg., New York... *pp. 148, 149*

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

WEBSTER & CO., WARREN, Camden, N. J. ... *pp. 108, 109, 110*

VARIABLE SPEED TRANSMISSIONS

(See Transmissions, Variable Speed)

VENEER CUTTING MACHINERY

American-Blakeslee Mfg. Co., Birmingham, Ala.
Hubbard's Sons, Norman, 265 Water St., Brooklyn, N. Y.

Merritt Mfg. Co., Lockport, N. Y.

VENTILATING SYSTEMS

AMERICAN BLOWER CO., Detroit, Mich. ... *pp. 434, 435*

Barney Ventilating Fan Works, 19 Chardon St., Boston, Mass.

BRAEMER AIR CONDITIONING CORP'N, Lafayette Bldg., Philadelphia, Pa... *p. 470*

Cramer, Stuart W., Charlotte, N. C.

Dicks, Slosson Co., Inc., 302 Broadway, New York

Garden City Fan Co., McCormick Bldg., Chicago, Ill.

Howard & Morse, 45 Fulton St., New York

Ilg Electric Ventilating Co., 154 Whiting St., Chicago, Ill.

Kernchen Co., McCormick Bldg., Chicago, Ill.

Merrill, Inc., C. J., 131 Preble St., Portland, Me.

New England Ventilating & Heating Co., Providence, R. I.

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... *p. 476*

STERLING BLOWER CO., Hartford, Conn. ... *p. 436*

STURTEVANT CO., B. F., Hyde Park, Boston, Mass... *pp. 74, 75*

Western Blower Co., 1800 9th Ave. South, Seattle, Wash.

VENTILATORS, ROOF

Aspromet Co., First National Bank Bldg., Pittsburgh, Pa.

Bicalky Fan Co., 860 Prospect Ave., Buffalo, N. Y.

Burt Mfg. Co., Akron, O.

Dixie Mfg. Co., Inc., Russell St. & B. & O. R. R., Baltimore, Md.

Drouve Co., G., Bridgeport, Conn.

Kernchen Co., McCormick Bldg., Chicago, Ill.

New England Ventilating & Heating Co., Providence, R. I.

Nightingale & Childs Co., 205 Congress St., Boston, Mass.

Ohio Blower Co., Cleveland, O.

Pullman Ventilator and Mfg. Co., 205 W. York Ave., York, Pa.

SKINNER BROS. MFG. CO., 10th & Tyler Sts., St. Louis, Mo... *p. 476*

STERLING BLOWER CO., Hartford, Conn. ... *p. 436*

Van Noorden Co., E., 102 Magazine St., Roxbury, Mass.

VENTS, AIR (Tank Wagon)
MORRISON BROS., Dubuque, Ia... *p. 495*

VIBRATORS, PNEUMATIC

U. S. Molding Machine Co., 968 E. 69th Place, Cleveland, O.

Tesmer Machine & Tool Co., 285-91 Rivard St., Detroit, Mich.

VISCOSIMETERS

TAGLIABUE MFG. CO., C. J., 18-88 33rd St., Brooklyn, N. Y... *p. 535*

VICES

—Bench

Athol Machine Co., Athol, Mass.

Carter & Hakes Machine Co., Winsted, Conn.

Emmert Mfg. Co., Waynesboro, Pa.

Fulton Machine & Vise Co., Lowville, N. Y.

NEW BRITAIN MACHINE CO., New Britain, Conn... *p. 336*

Prentiss Vise Co., 110 Lafayette St., New York

Rearwin, W. D., 341 Mill Ave., Grand Rapids, Mich.

Rock Island Mfg. Co., Rock Island, Ill.

Western Tool & Mfg. Co., Springfield, O.

—Divided Machine

Schuchardt & Schutte, 90 West St., New York

—Drill Press

Bicknell Mfg. & Supply Co., Janesville, Wis.

Graham Mfg. Co., Providence, R. I.

HOGGSON & PETTIS MFG. CO., New Haven, Conn... *pp. 394, 395, 396*

Nestor Mfg. Co., Inc., 40 W. 13th St., New York

NEWHALL CHAIN FORGE & IRON CO., 90 West St., New York... *p. 279*

Rearwin, W. D., 341 Mill Ave., Grand Rapids, Mich.

Skinner Chuck Co., New Britain, Conn.

Sanford Mfg. Co., F. C., Bridgeport, Conn.

—Machine Tool

Ketchum Tool Equipment Co. (Sanford), First Bridgeport National Bank Bldg., Bridgeport, Conn.

Lawson & Co., Inc., 90 West St., New York

PRATT & WHITNEY CO., 111 Broadway, New York... *p. 344*

Queen City Machine Tool Co., 1405 Sycamore St., Cincinnati, O.

Sanford Mfg. Co., F. C., Bridgeport, Conn.

—Pattern Makers'

Upton & Gilman Machine Co., 587 Middlesex St., Lowell, Mass.

—Pipe

*CRANE CO., 836 S. Michigan Ave., Chicago, Ill... *pp. 120, 121, 122, 123*

Fulton Machine & Vise Co., Lowville, N. Y.

*GREENFIELD TAP & DIE CORP'N, Greenfield, Mass... *pp. 374, 375*

MARK MFG. CO., P. O. Box G, Chicago, Ill. ... *p. 160*

Prentiss Vise Co., 110 Lafayette St., New York

Reed Mfg. Co., Erie, Pa.

Saunders' Sons, Inc., D., 21 Atherton St., Yonkers, N. Y.

SIMMONS CO., JOHN, 110 Center St., New York... *p. 515*

Spencer Regulator Co., 5 & 7 Front St., Salem, Mass.

Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo, O.

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... *p. 397*

—Wood Working

Emmert Mfg. Co., Waynesboro, Pa.

Prentiss Vise Co., 110 Lafayette St., New York

VOLTMETERS

BIDDLE, JAMES G., 1211-1213 Arch St., Philadelphia, Pa... *p. 539*

BRISTOL CO., Waterbury, Conn... *p. 530*

BROWN INSTRUMENT CO., Philadelphia, Pa... *p. 531*

*GENERAL ELECTRIC CO., Schenectady, N. Y... *pp. 20, 21, 521*

Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio

Jewell Electrical Instrument Co., 1650 Walnut St., Chicago, Ill.

Vol

VOLTMETERS (Continued)

Pignolet, Louis M., 78 Cortlandt St., New York
 REPUBLIC FLOW METERS CO., 565 W.
 Washington Blvd., Chicago, Ill. .p. 522
 WELLMAN-SEAVER-MORGAN CO., 7000
 Central Ave., Cleveland, O. .p. 272
 *WESTINGHOUSE ELECTRIC & MFG. CO.,
 East Pittsburgh, Pa. .pp. 114, 115

VULCANIZERS

*BIGELOW CO., 76 River St., New Haven,
 Conn. .p. 40
 DILLON STEAM BOILER WORKS, D. M.,
 Fitchburg, Mass. .pp. 44, 45
 KOVEN & BROTHER, L. O., 154 Ogden Ave.,
 Jersey City, N. J. .p. 494
 Smith & Son Co., Samuel, 130-150 Railroad Ave.,
 Paterson, N. J.
 WILLIAMS FOUNDRY & MACHINE CO.,
 54-56 Cherry St., Akron, O. .p. 214

W**WALL BRACKETS AND FRAMES**

DODGE SALES & ENGINEERING CO.,
 Mishawaka, Ind. .pp. 202, 203, 204, 205, 206
 *FALLS CLUTCH & MACHINERY CO.,
 Cuyahoga Falls, O. .p. 207

WASHERS

—Cast Iron
 WASHBURN & GRANGER, 50 Church St.,
 New York. .p. 91
 Wrought Washer Mfg. Co., Milwaukee, Wis.
 —Copper
 Guillott Metal Gasket & Supply Co., 24 S.
 Clinton St., Chicago, Ill.
 —Felt
 Booth Felt Co., Inc., 440-450 14th St., Brooklyn,
 N. Y.

—Lead
 Guillott Metal Gasket & Supply Co., 24 S.
 Clinton St., Chicago, Ill.
 UNITED LEAD CO., 111 Broadway, New
 York. .p. 299

—Leather
 GRATON & KNIGHT MFG. CO., Worcester,
 Mass. .p. 237
 MARK MFG. CO., P. O. Box G, Chicago,
 Ill. .p. 160

—Lock
 National Lock Washer Co., Newark, N. J.
 Positive Lock Washer Co., Newark, N. J.

—Rubber
 GOODRICH RUBBER CO., B. F., Akron,
 O. .pp. 183, 242
 *JENKINS BROS., 80 White St., New York
 . .pp. 128, 129

—Steel
 CINCINNATI SCREW CO., Twilight, O.
 (Cincinnati Suburb). .p. 402
 WORCESTER PRESSED STEEL CO., Wor-
 cester, Mass. .p. 305

—Thrust
 BOSSERT CORP'N, Utica, N. Y. .p. 304
 *GWILLIAM CO., 253 W. 58th St., New York
 . .pp. 234, 235
 Michigan Screw Co., Lansing, Mich.

—Vulcanized Fibre
 AMERICAN VILCANIZED FIBRE CO., Wil-
 mington, Del. .p. 296
 *DIAMOND STATE FIBRE CO., Bridgeport,
 Pa. .p. 298

*JOHNS-MANVILLE CO., H. W., 296 Madison
 Ave., New York. .p. 162

—Wrought
 AUBURN BALL BEARING CO., 22 Elizabeth
 St., Rochester, N. Y. .p. 215
 Cleveland Wrought Products Co., Cleveland,
 O.

COLUMBUS BOLT WORKS CO., Columbus,
 O. .p. 405
 Hall's Sons, Samuel, 229 W. 10th St., New York
 Mason Machine Co., Inc., Jos. M., 2305 N.
 Marshall St., Philadelphia, Pa.
 MILTON MFG. CO., Milton, Pa. .p. 406
 Nicetown Plate Washer Co., Nicetown, Phila-
 delphia, Pa.
 Wrought Washer Mfg. Co., Milwaukee, Wis.

WASHING AND SCREENING MACHINERY

(Gravel and Rock)
 BARTLETT & SNOW CO., C. O., Cleveland,
 O. .p. 249
 Excavating & Screening Machinery Co., 743
 Security Bldg., Minneapolis, Minn.
 Reliance Steel Casting Co., Pittsburgh, Pa.

WASTE WASHING CENTRIFUGALS

(See Centrifugals, Oil and Waste)
WATCHMAN'S RECORDERS
 Hardinge Bros., Inc., 1770 Berceau Ave., Chicago,
 Ill.

Newman Clock Co., 178 Fulton St., New York
 Simplex Time Recorder Co. (Simplex), Gardner,
 Mass.

WATER BACKS (Pressure)

*EDGE MOOR IRON CO., Edge Moor, Del.
 . .p. 46

*GREEN ENGINEERING CO., 13 Kennedy
 Ave., East Chicago, Ind. .pp. 80, 81

**WATER CIRCULATORS, FILTERS, GAGES,
 HEATERS, METERS, SPRAYS, ETC.**
 (See Circulators, Filters, Gages, Heaters, Meters,
 Sprays, Etc., Water)

WATER COLUMNS
 AMERICAN STEAM GAUGE & VALVE
 MFG. CO., Boston, Mass. .pp. 142, 143

*ASHTON VALVE CO., 161 First St., Cam-
 bridge, Boston, Mass. .p. 526

*CRANE CO., 836 S. Michigan Ave., Chicago,
 Ill. .pp. 120, 121, 122, 123

—Alarm

Chicago Automatic Switch Co., 212 N. Peoria
 St., Chicago, Ill.
 Engineering Co. of Philadelphia, Harrison
 Bldg., Philadelphia, Pa.
 Hills-McCanna Co., 153 W. Kinzie St., Chicago,
 Ill.

KIELEY & MUELLER, INC., 34 W. 13th St.,
 New York. .p. 146
 Plouff Co., 1500 River St., Boston, Mass.
 Reliance Gauge Column Co. (Reliance), Cleve-
 land, Ohio
 Steigert Co., L., N. E. Cor. Elder & Sogan Sts.,
 Cincinnati, O.
 Williams Gauge Co., 543 Fourth Ave., Pitts-
 burgh, Pa.

—Railroad

Stickney Co., Charles A., St. Paul, Minn.

WATER CONTROLLING APPARATUS

*HUNT MACHINE CO., RODNEY, Orange,
 Mass. .p. 449

WATER COOLING APPLIANCES

BLAW-KNOX CO. (Knox), Pittsburgh, Pa. .p.
 489
 Cooling Tower Co., 15 John St., New York

WATER PROOFING MATERIALS

Barber Asphalt Paving Co., Land Title Bldg.,
 Philadelphia, Pa.
 Barrett Co., 17 Battery Place, New York
 *JOHNS-MANVILLE CO., H. W., 296 Madison
 Ave., New York. .p. 162
 Master Builders Co., 606 Union Bldg., Cleve-
 land, O.
 Sonneborn Sons, Inc., L., 262 Pearl St., New
 York

Toch Brothers, 320 Fifth Ave., New York
 Trus-Con Laboratories, Detroit, Mich.
 Warner-Quinlan Asphalt Co., 79 Wall St., New
 York

WATER PURIFYING PLANTS

Chemo-Mechanical Water Improvement Co.,
 Bulletin Bldg., Philadelphia, Pa.

Advertisements of firms marked * appear in The Journal, A. S. M. E.

Cookson Steam Specialty Co., 62 Central Ave., Cincinnati, O.
 Detroit Steam Appliance Co., 500 Union Trust Bldg., Detroit, Mich.
DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 101, 202, 203, 204, 205, 206.
HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... pp. 104, 105.
***HODGES WATER STILL CO., INC.**, 1234 Callowhill St., Philadelphia, Pa... p. 500.
 Hygeia Filter Co., 338 Denton Ave., Detroit, Mich.
 International Filter Co., 40 S. Dearborn St., Chicago, Ill.
 Loomis-Manning Filter Distributing Co., 1421 S. 37th St., Philadelphia, Pa.
 Michigan Engineering Co., Union Trust Bldg., Detroit, Mich.
 New York Continental Jewell Filtration Co., 15 Broad St., New York
 Permutit Co., 440—4th Ave., New York
 Pittsburgh Filter Mfg. Co., Pittsburgh, Pa.
 Roberts Filter Mfg. Co., Darby, Pa.
***SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... pp. 103, 498
WATER SOFTENERS
 American Water Softener Co., 1011 Chestnut St., Philadelphia, Pa.
 Booth Co., L. M., 62 Hudson St., Jersey City, N. J.
 Borromite Co. of America, 105 W. Monroe St., Chicago, Ill.
 Chemo-Mechanical Water Improvement Co., Bulletin Bldg., Philadelphia, Pa.
 Detroit Steam Appliance Co., 500 Union Trust Bldg., Detroit, Mich.
DODGE SALES & ENGINEERING CO., Mishawaka, Ind... pp. 102, 202, 203, 204, 205, 206.
 Graver Tank Works, Wm., 28 E. Jackson Blvd., Chicago, Ill.
HARRISON SAFETY BOILER WORKS (Cochrane), 3130 N. 17th St., Philadelphia, Pa... pp. 104, 105.
 International Filter Co., 40 S. Dearborn St., Chicago, Ill.
 Michigan Engineering Co., Union Trust Bldg., Detroit, Mich.
 Northern Water Softener Co., Madison, Wis.
 Permutit Co., 440—4th Ave., New York
 Power Plant Specialty Co., 1306 Monadnock Bldg., Chicago, Ill.
 Refinite Co. (Zoolite), 514 Farnam Bldg., Omaha, Neb.
 Reisert Automatic Water Purifying Co., 23 E. 26th St., New York
 Richmond Water Softener Co., Richmond, Ind.
***SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... pp. 103, 498
WATER STERILIZERS
 Electric Water Sterilizer & Ozone Co., Scottsdale, Pa.
 R. U. V. Co., Inc., 120 Broadway, New York
WATER SUPPLY SYSTEMS
 Dayton Pump & Mfg. Co., 5th & Northwood Sts., Dayton, O.
 DEMING CO., Salem, O... p. 440
 Latta-Martin Pump Co., Hickory, N. C.
***SCAIFE & SONS CO.**, WM. B., Pittsburgh, Pa... pp. 103, 498
 Standard Pump & Engine Co., Akron, O.
WATER TUBE BOILERS
 (See Boilers, Water Tube)
WATER WHEELS
 (See Turbines, Hydraulic)
WATERWORKS SUPPLIES
 Bayard & Co., M. L., Woodbine, N. J.
 Clow & Sons, James B., Chicago, Ill.
DARLING PUMP & MFG. CO., LTD., Williamsport, Pa... p. 124
 Pitometer Co., 25 Elm St., New York
 Standard Spiral Pipe Works, 4801 S. Rockwell St., Chicago, Ill.

Walker Mfg. Co., Fenton, Mich.
WOOD & CO., R. D., Philadelphia, Pa... p. 458
WATT-HOUR METERS
 (See Meters, Watt-Hour)
WATTMETERS
BRISTOL CO., Waterbury, Conn... p. 530
***GENERAL ELECTRIC CO.**, Schenectady, N. Y... pp. 20, 21, 521
 Hickock Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
***WESTINGHOUSE ELECTRIC & MFG. CO.**, East Pittsburgh, Pa... pp. 114, 115
***WESTON ELECTRICAL INSTRUMENT CO.**, 49 Weston Ave., Waverly Park, Newark, N. J... p. 537
WEBBING
 Gilmer Co., L. H., Tacony, Philadelphia, Pa.
 Lambeth Rope Corp'n, New Bedford, Mass.
WEIGHERS
 —Conveying
CONVEYING WEIGHER CO., 90 West St., New York... p. 251
***LINK-BELT CO.**, 39th St. & Stewart Ave., Chicago, Ill... p. 256
 —Water
***AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y... p. 140
RICHARDSON SCALE CO., Passaic, N. J... p. 514
SIMMONS CO., JOHN, 110 Center St., New York... p. 515
WILLCOX ENGINEERING CO., Saginaw, Mich... p. 516
***YARNALL-WARING CO.** (Yarway), Chestnut Hill, 7603-20 Queen St., Philadelphia, Pa... p. 139
WEIGHING MACHINERY (Automatic)
AMERICAN KRON SCALE CO., 430 E. 53rd St., New York... p. 513
 Automatic Weighing Machine Co., 134-140 Commerce St., Newark, N. J.
 Computing Scale Co., Dayton, O.
 Electric Weighing Co., 182 Thirteenth Ave., New York
 Fairbanks & Co., E. & T. St. Johnsbury, Vt.
RICHARDSON SCALE CO., Passaic, N. J... p. 514
SIMMONS CO., JOHN, 110 Center St., New York... p. 515
 Streeter-Amet Weighing & Recording Co., 4101-05 Ravenwood Ave., Chicago, Ill.
WELDING
 —Chemical Reaction
 Metal & Thermit Corp'n, 120 Broadway, New York
 —Electric
BOSSERT CORP'N, Utica, N. Y... p. 304
 Lawrence & Co., L., 290 Halsey St., Newark, N. J.
 Lincoln Electric Co., Kelly Ave. & 38th St., Cleveland, O.
 Metals Welding Co., 4400 Perkins Ave., Cleveland, O.
MORRISON BROS., Dubuque, Ia... p. 495
QUASI ARC WELDTRODE CO., INC., 107-109 Lafayette St., New York... p. 422
 Rochester Welding Works, 349 Orchard St., Rochester, N. Y.
 Standard Parts Co., Edgewater Park, Cleveland, O.
 Standard Screw Products Co., Bellevue & Warren Ave., Detroit, Mich.
 Thomson Electric Welding Co., Lynn, Mass.
 Universal Electric Welding Co., 67-69 Sixth St., Long Island City, N. Y.
WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y... p. 397
 Winfield Electric Welding Machine Co., 10-16 Atlantic St., Warren, O.
 —Hammer
 Kellogg Co., M. W., 90 West St., New York

Wel

WELDING (Continued)**—Lap**

American Welding Co., Carbondale, Pa.

—Oxy-Acetylene

American Tube Bending Co., New Haven, Conn.

—SpotBOSSERT CORP'N, Utica, N. Y. . . . *p. 304**PITTSBURGH VALVE, FOUNDRY & CONST. CO., Pittsburgh, Pa. . . . *pp. 132, 133***—Chemical Reaction**

Winfield Electric Welding Machine Co., 10-16 Atlantic St., Warren, O.

Universal Electric Welding Co., 67-69 Sixth St., Long Island City, N. Y.

WELDING AND BRAZING

American Tube Bending Co., New Haven, Conn.

WELDING AND CUTTING APPARATUS**(Oxy-Acetylene, Etc.)**

Air Reduction Sales Co., 120 Broadway, New York

Burdett Mfg. Co., 309 St. Johns Court, Chicago, Ill.

Cave Welding & Mfg. Co., 32 Liberty St., Springfield, Mass.

Cox Brass Mfg. Co., Albany, N. Y.

Dyer Co., G. H., 155 Brookline St., Cambridge, Mass.

Economy Welding Machine Co., S. W. Blvd. & Central, Kansas City, Mo.

General Welding & Equipment Co., 107 Mass Ave., Boston, Mass.

Henderson-Willis Welding & Cutting Co., 2305 07-09 N. 11th St., St. Louis, Mo.

Imperial Brass Mfg. Co. (Imperial), 1200 W. Harrison St., Chicago, Ill.

K-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York. . . . *p. 410*

MacLeod Co., Bogen St., Cincinnati, Ohio

Messier & Co., 121 N. 7th St., Philadelphia, Pa.

Metals Welding Co., 4400 Perkins Ave., Cleveland, O.

MILBURN CO., ALEXANDER, Baltimore, Md. . . . *p. 420*

Modern Engineering Co., 23rd & Walnut Sts., St. Louis, Mo.

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J. . . . *p. 421*

Oxy-Carbi Co., New Haven, Conn.

SAFETY CAR HEATING & LIGHTING CO., 2 Rector St., New York. . . . *p. 505*

Thermalene Co., Chicago Heights, Ill.

Waterhouse Welding Co., 2 Pelham St., Boston, Mass.

WELDING AND CUTTING WORK

Acetylene Welding Co., 241-245 E. 136th St., New York

Cave Welding & Mfg. Co., 32 Liberty St., Springfield, Mass.

Davis-Bournonville Co., Jersey City, N. J.

Economy Welding Machine Co., S. W. Blvd. & Central, Kansas City, Mo.

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.

K-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York. . . . *p. 410*

Linde Air Products Co., 30 E. 42nd St., New York

MORRISON BROS., Dubuque, Ia. . . . *p. 405*OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J. . . . *p. 421*

Rochester Welding Works, 319 Orchard St., Rochester, N. Y.

Whitney Felker Co., E. Tioga & Memphis Sts., Philadelphia, Pa.

WORCESTER PRESSED STEEL CO., Worcester, Mass. . . . *p. 305***WELDING MACHINES, ELECTRIC**

C & C Electric & Mfg. Co., Garwood, N. J.

Detroit Electric Welder Co., 710 E. Kalamazoo St., Lansing, Mich.

Eveland Electric Riveter Co., West End Trust Bldg., Philadelphia, Pa.

Federal Machine & Welder Co., Warren, O.

Universal Electric Welding Co., 67-69 Sixth St., Long Island City, N. Y.

*WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. . . . *pp. 114, 115*

Winfield Electric Welding Machine Co., 10-16 Atlantic St., Warren, O.

—Arc Method*GENERAL ELECTRIC CO., Schenectady, N. Y. . . . *pp. 20, 21, 521*QUASI ARC WELDTRODE CO., INC., 107-109 Lafayette St., New York. . . . *p. 422*WILSON WELDER & METALS CO., INC., 2 Rector St., New York. . . . *p. 423***WELDING SUPPLIES**

Cave Welding & Mfg. Co., 32 Liberty St., Springfield, Mass.

Henderson-Willis Welding & Cutting Co., 2305-07-09 N. 11th St., St. Louis, Mo.

K-G WELDING & CUTTING CO., INC., 556 W. 34th St., New York. . . . *p. 410*

Modern Engineering Co., 23rd & Walnut Sts., St. Louis, Mo.

OXWELD ACETYLENE CO., 646-686 Frelinghuysen Ave., Newark, N. J. . . . *p. 421*QUASI ARC WELDTRODE CO., INC., 107-109 Lafayette St., New York. . . . *p. 422*

Thermalene Co., Chicago Heights, Ill.

WELL-DRILLING MACHINERY

American Well Works, Aurora, Ill.

Armstrong Mfg. Co., Waterloo, Iowa

Keystone Driller Co., Beaver Falls, Pa.

National Supply Co., 136 Huron St., Toledo, O.

WELL SUPPLIESMARK MFG. CO., P. O. Box G, Chicago, Ill. . . . *p. 160***WHEATSTONE BRIDGES**

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

Thompson-Levering Co., 325 Arch St., Philadelphia, Pa.

WHEELS**—Car**

American Car & Foundry Co., 165 Broadway, New York

BASS FOUNDRY & MACHINE CO., Fort Wayne, Ind. . . . *p. 35*

Blakeslee Mfg. Co., DuQuoin, Ill.

*FULLER-LEHIGH CO., Fullerton, Pa. . . . *p. 92**LINK-BELT CO., 39th St. & Stewart Ave., Chicago, Ill. . . . *p. 256*

Lobdell Car Wheel Co., Wilmington, Del.

Midvale Steel & Ordnance Co., Widener Bldg., Philadelphia, Pa.

Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.

Railway Steel Spring Co., 30 Church St., New York

—Iron and Rubber

Clark Co., Geo. P., Windsor Locks, Conn.

—Mine Car

American Car & Foundry Co., 165 Broadway, New York

AMERICAN PULLEY CO., 4200 Wissahickon Ave., Philadelphia, Pa. . . . *p. 200*

Brownsville Foundry & Machine Co., South Brownsville, Pa.

*FULLER-LEHIGH CO., Fullerton, Pa. . . . *p. 92*

Hockensmith Wheel & Mine Car Co., Penn Station, Pa.

Watt Mining Car Wheel Co., Barnesville, O.

—Pressed Steel

Detroit Pressed Steel Co., Detroit, Mich.

—Roller Bearing

Blakeslee Mfg. Co., DuQuoin, Ill.

Hockensmith Wheel & Mine Car Co., Penn Station, Pa.

Sanford-Day Iron Works, Knoxville, Tenn.

—Steel (Motor Truck)

Clark Equipment Co., 1415 Railway Exchange, Buchanan, Mich.

Wel

Indestructible Wheel Co., Lebanon, Ind.
Massillon Steel Casting Co., Massillon, O.
P. T. Wheel Co. of America, Inc., P. O. Box 574,
Dayton, O.

—Steel, Rolled

Edgewater Steel Co., Farmers Bank Bldg.,
Pittsburgh, Pa.
Standard Steel Works Co., Morris Bldg., Phila-
delphia, Pa.

—Traction

Engine & Machinery Co., Canton, O.

—Trolley

*FULLER-LEHIGH CO., Fullerton, Pa... p. 92

—Wire (Automobile)

STANDARD ROLLER BEARING CO., Phila-
delphia, Pa... pp. 20, 231

WHISTLES, STEAM

AMERICAN STEAM GAUGE & VALVE
MFG. CO., Boston, Mass... pp. 142, 143

*ASHTON VALVE CO., 161 First St., Cam-
bridge, Boston, Mass... p. 526

*BROWN CO., A. & F., 79 Barclay St., New
York... p. 187

*CRANE CO., 836 S. Michigan Ave., Chicago,
Ill... pp. 120, 121, 122, 123

CROSBY STEAM GAGE & VALVE CO., 40
Central St., Boston, Mass... p. 527

LONGERAN CO., J. E., 211-215 Race St.,
Philadelphia, Pa... pp. 127, 528

Powell Co., William, Cincinnati, O.
Union Water Meter Co., 33 Hermon St., Wor-
cester, Mass.

WHITE METALS

(See Metals, White)

WINCHES

—Ship

American Hoist & Derrick Co., St. Paul, Minn.
Dake Engine Co., Grand Haven, Mich.

Eckliff Circulator Co. (J.-H.), 46 Shelby St.,
Detroit, Mich.

FLORY MFG. CO., S., Bangor, Pa... p. 269

Gray Aldrich Co., Inc., 33 Commercial Wharf,
Boston, Mass.

*LIDGERWOOD MFG. CO., 96 Liberty St.,
New York... p. 271

Round & Son, D., Cleveland, O.

—Truck

Bay City Foundry & Machine Co. (Bay City
Winch), 26th & Water Sts., Bay City, Mich.

Erie Hoist Co., 2101 Holland St., Erie, Pa

WINDING MACHINES

Universal Winding Co., Boston, Mass.

WIRE

—All Metals (In Fine Gauges)

AMERICAN BRASS CO., Waterbury, Conn.
... p. 295

Michigan Wire Cloth Co., 536 Howard St.,
Detroit, Mich.

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J... p. 281

WRIGHT WIRE CO., Worcester, Mass... p. 282

—Aluminum

ALUMINUM CO. OF AMERICA, Pittsburgh,
Pa... p. 294

—Annealed

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J... p. 281

WRIGHT WIRE CO., Worcester, Mass... p. 282

—Brass and Copper

AMERICAN BRASS CO., Waterbury, Conn.
... p. 295

Hazard Mfg. Co., Wilkes-Barre, Pa.

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J... p. 281

Seymour Mfg. Co., Seymour, Conn.

WRIGHT WIRE CO., Worcester, Mass... p. 282

—Flat

Prentiss & Co., Geo. W., Holyoke, Mass.

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J... p. 281

Spencer Wire Co., Worcester, Mass.
WRIGHT WIRE CO., Worcester, Mass... p. 282

—Iron and Steel

Atlantic Steel Co., Atlanta, Ga.

Interstate Iron & Steel Co., 104 S. Michigan Ave.,
Chicago, Ill.

Pittsburgh Steel Co., Union Arcade Bldg.,
Pittsburgh, Pa.

Prentiss & Co., Geo. W., Holyoke, Mass.

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J... p. 281

Spencer Wire Co., Worcester, Mass.

United States Steel Products Co., 4th Ave. &
Connecticut St., Seattle, Wash.

WHELOCK, LOVEJOY & CO., 23 Cliff St.,
New York... p. 301

WRIGHT WIRE CO., Worcester, Mass... p. 282

—Lead

UNITED LEAD CO., 111 Broadway, New
York... p. 299

—Monel Metal

Supple-Biddle Hardware Co., 512 Commerce
St., Philadelphia, Pa.

—Nickel

Haring, Ellsworth, 114 Liberty St., New York

—Welding

Apex Steel Corp'n, 50 Church St., New York

Central Steel & Wire Co., 119 N. Peoria St.,
Chicago, Ill.

OXWELD ACETYLENE CO., 646-686 Freling-
huysen Ave., Newark, N. J... p. 421

Prentiss & Co., Geo. W., Holyoke, Mass.

Swedish Iron & Steel Corp'n, 12 Platt St., New
York

WIRE AND CABLES, ELECTRICAL

ALUMINUM CO. OF AMERICA, Pittsburgh,
Pa... p. 294

AMERICAN BRASS CO., Waterbury, Conn.
... p. 295

American Steel & Wire Co., 72 W. Adams St.,
Chicago, Ill.

D & W FUSE CO., Providence, R. I... p. 393

*GENERAL ELECTRIC CO., Schenectady,
N. Y... pp. 20, 21, 521

GOODRICH RUBBER CO., B. F., Akron,
O... pp. 183, 242

Hazard Mfg. Co., Wilkes-Barre, Pa.

NEW ENGLAND BUTT CO., Providence,
R. I... p. 484

*ROEBLING'S SONS CO., JOHN A., Trenton,
N. J... p. 281

United States Steel Products Co., 4th Ave. &
Connecticut St., Seattle, Wash.

Western Electric Co., Inc., 195 Broadway, New
York

WIRE CARDS

Rogers Wire Works, Inc., 291 Broadway, New
York

WIRE COILING MACHINERY

SLEEPER & HARTLEY, INC., Worcester,
Mass... p. 486

WIRE CLOTH

(See Cloth, Wire)

WIRE DRAWING MACHINERY

Aetna Foundry & Machine Co., Warren, O.

New England Wire Machinery Co., New Haven,
Conn.

Richard Mfg. Co., Bloomsburg, Pa.

Standard Machinery Co., Auburn, R. I.

TORRINGTON MFG. CO., Torrington, Conn.
... p. 483

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

WIRE FORMING MACHINES

Atlas Machine Co., 140 Manhan St., Waterbury,
Conn.

Baird Machine Co., Bridgeport, Conn.

BLAKE & JOHNSON CO., Waterbury, Conn.
... p. 482

Cobden Machine Works, Cobden, Ill.

Hinsman Machine & Tool Co., Elm St., West-
field, Mass.

Manville Machine Co., E. J., Waterbury, Conn.

Wir

See Catalogue Section for data of firms listed in capital type

WIRE FORMING MACHINES (Continued)**SLEEPER & HARTLEY, INC.**, Worcester, Mass... *p.* 486

Smurr & Kamen Co., 328 No. Albany Ave., Chicago, Ill.

TOLEDO MACHINE & TOOL CO., Toledo, O... *p.* 313**WIRE INSULATING MACHINERY**

(See Insulating Machinery)

WIRE MECHANISM (Lever Control)***WILLIAM CO.** (Bowden), 253 W. 58th St., New York... *pp.* 234, 235**WIRE MILL MACHINERY**

Brown Engine Co., Fitchburg, Mass.

Morgan Construction Co., Worcester, Mass.

TORRINGTON MFG. CO., Torrington, Conn... *p.* 483

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

WIRE NAIL MACHINERY

National Machinery Co., Tiffin, O.

Perkins Co., Henry, Bridgewater, Mass.

SLEEPER & HARTLEY, INC., Worcester, Mass... *p.* 486**WIRE ROPE**

(See Rope, Wire)

WIRE ROPE FASTENINGS**American Hoist & Derrick Co.** (Crosby), St. Paul, Minn.

Broderick & Bascom Rope Co., St. Louis, Mo.

***CLYDE IRON WORKS**, 29th Ave., W., & Michigan St., Duluth, Minn... *p.* 268

Hazard Mfg. Co., Wilkes-Barre, Pa.

MACOMBER & WILYTE ROPE CO., Kenosha, Wis... *p.* 280

Moon Co., Inc., George C., Garwood, N. J.

***ROEBLING'S SONS CO.**, JOHN A., Trenton, N. J... *p.* 281**WILLIAMS & CO.**, J. H., 70 Richards St., Brooklyn, N. Y... *p.* 397**Williamsport Wire Rope Co.**, Williamsport, Pa.**WRIGHT WIRE CO.**, Worcester, Mass... *p.* 282

Wir

WIRE ROPE MACHINES**NEW ENGLAND BUTT CO.**, Providence, R. I... *p.* 484**New England Wire Machinery Co.**, New Haven, Conn.**WIRE SPECIALTIES****Cuyahoga Spring Co.**, Waterloo Road, Cleveland, O.**Gem Stopper Co.**, 2120 Nicholas St., Philadelphia, Pa.**New Jersey Wire Cloth Co.**, Trenton, N. J.***ROEBLING'S SONS CO.**, JOHN A., Trenton, N. J... *p.* 281**Spencer Wire Co.**, Worcester, Mass.**WIRE STRAIGHTENING AND CUTTING MACHINERY****Nilson Machine Co.**, A. H., 1525 Railroad Ave., Bridgeport, Conn.**Shuster Co.**, F. B., New Haven, Conn.**SLEEPER & HARTLEY, INC.**, Worcester, Mass... *p.* 486**WIRE STRANDING MACHINERY****New England Wire Machinery Co.**, New Haven, Conn.**WIRE TESTING MACHINES****OLSEN TESTING MACHINE CO.**, TINIUS, 500 N. 12th St., Philadelphia, Pa... *p.* 511**RIEHLÉ BROS. TESTING MACHINE CO.**, 1424 N. 9th St., Philadelphia, Pa... *p.* 512**WIRING DEVICES****BENJAMIN ELECTRIC MFG. CO.**, 122 S. Sangamon St., Chicago, Ill... *p.* 504**Carleton-Mace Engine Corp'n**, 38 Chardon St., Boston, Mass.**Electric Co.**, 94 Allyn St., Hartford, Conn.***GENERAL ELECTRIC CO.**, Schenectady, N. Y... *pp.* 20, 21, 521**WOOD PRODUCTS****American Balsa Corp'n**, 50 E. 42nd St., N. Y. **Rutland Mfg. Co., Inc.**, Forest, West & Pine Sts., Rutland, Vt.**WOOD SEASONING****American Balsa Corp'n**, 50 E. 42nd St., N. Y.**WOOD SCREW MACHINERY****Cook Co.**, Asa S., Hartford, Conn.**Townsend Mfg. Co.**, H. P., Hartford, Conn.**WOOD WORKING MACHINERY*****AMERICAN DISTRICT STEAM CO.**, North Tonawanda, N. Y... *p.* 140**Crescent Machine Co.**, Leetonia, O.**Defiance Machine Works**, Defiance, O.**Enterprise Co.**, Columbiana, Ohio**Falls Machine Co.**, Sheboygan Falls, Wis.**Fay & Egan Co.**, J. A., Cincinnati, O.**Garland Co.**, M., Bay City, Mich.**Greenlee Bros. & Co.**, Rockford, Ill.**JONES FOUNDRY & MACHINE CO.**, W. A., 4401 W. 12th St., Chicago, Ill... *p.* 194**Knickerbocker Co.**, Jackson, Mich.**NEW BRITAIN MACHINE CO.**, New Britain Conn... *p.* 336**Newman Machine Co.**, Jackson St. & Sou. Ry., Greensboro, N. C.**Oliver Machinery Co.**, Grand Rapids, Mich.**Olney & Warren**, 406-412 Broome St., New York**Pettingill Machine Co.**, Amesbury, Mass.**Prybil Machine Co.**, F., 512 W. 41st St., N. Y.**Silver Mfg. Co.**, Salem, O.**Sinker Davis Co.**, Indianapolis, Ind.**Valley City Machine Works**, 12-16 Campau Ave., Grand Rapids, Mich.**Wallace, J.D.**, 1401 W. Jackson Blvd., Chicago, Ill.**Woods Machine Co.**, S. A., 27 Damrell St., South Boston, Mass.**WOOLEN MACHINERY****Curtis & Marble Machine Co.**, 78 Cambridge St., Worcester, Mass.**Davis & Furber Machine Co.**, North Andover, Mass.**Whitin Machine Works**, Whitinsville, Mass.**WORK HOLDERS**

(See Holders, Work)

WORK STANDS, PORTABLE**NEW BRITAIN MACHINE CO.**, New Britain, Conn... *p.* 336**WORM DRIVERS****Cleveland Worm Gear Co.**, Cleveland, O.**Hindley Gear Co.**, 1105 Frankford Ave., Philadelphia, Pa.**JONES FOUNDRY & MACHINE CO.**, W. A., 4401 W. 12th St., Chicago, Ill... *p.* 193**WORSTED MACHINERY****Franklin Machine Co.**, 189 Charles St., Providence, R. I.**Saco-Lowell Shops**, 77 Franklin St., Boston, Mass.**WRAPPING MACHINERY****Ferguson, M.B.**, 2491 Bedford Ave., Brooklyn, N.Y.**Stokes & Smith Co.**, Summerdale, Philadelphia, Pa.**WRENCHES****Armstrong Bros. Tool Co.**, 315 N. Francisco Ave., Chicago, Ill.**Keystone Mfg. Co.** (Westcott), 41-51 Chandler St., Buffalo, N. Y.**Lamson & Sessions Co.**, Cleveland, O.**Moore Drop Forging Co.**, Springfield, Mass.**Mossberg Co.**, Frank, Attleboro, Mass.**Page-Storms Drop Forge Co.**, Chicopee, Mass.***ROEBLING'S SONS CO.**, JOHN A., Trenton, N. J... *p.* 281**Trimont Mfg. Co.** (Trimo), Roxbury, Boston, Mass.**Whitman & Barnes Mfg. Co.**, Akron, O.**WORCESTER PRESSED STEEL CO.**, Worcester, Mass... *p.* 305**—Chain*****GREENE, TWEED & CO.**, 109 Duane St., New York... *p.* 168**KROESCHELL BROS. CO.** (Ideal), 460 West Erie St., Chicago, Ill... *p.* 56**Robbins, Gamwell & Co.**, Pittsfield, Mass.**Trimont Mfg. Co.** (Trimo), Roxbury, Boston, Mass.

MECHANICAL EQUIPMENT DIRECTORY

—Drop-Forged

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...*p. 397*

—Ratchet

***GREENE, TWEED & CO.,** 109 Duane St., New York...*p. 168*

Keystone Mfg. Co., 41-51 Chandler St., Buffalo, N. Y.

Lowell Wrench Co., 54 Commercial St., Worcester, Mass.

—Pipe

Trimont Mfg. Co. (Trimo), Roxbury, Boston, Mass.

Walworth Mfg. Co. (Stillson), First & O. Sts., South Boston, Mass.

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...*p. 397*

—Socket

Lowell Wrench Co., 54 Commercial St., Worcester, Mass.

WILLIAMS & CO., J. H., 70 Richards St., Brooklyn, N. Y...*p. 397*

—Tap

Bay State Tap & Die Co., Mansfield, Mass.
Card Mfg. Co., S. W., Rumford Ave., Mansfield, Mass.

Carpenter Tap & Die Co., J. M., Pawtucket, R. I.

***GREENFIELD TAP & DIE CORP'N,** Greenfield, Mass...*pp. 374, 375*

PRATT & WHITNEY CO., 111 Broadway, New York...*p. 344*

Y

YARN DRESSING MACHINERY

Franklin Machine Co., 189 Charles St., Providence, R. I.

Z

ZINC

Hazel Atlas Glass Co., Wheeling, W. Va.

—Electrolytic

U. S. Smelting Refining & Mining Co., 120 Broadway, New York

**DIRECTORY SECTION
PART II**

**Consulting Engineers'
Directory**

799

Pages 800-812

CONSULTING ENGINEERS' DIRECTORY

Compiled from returns received from the membership of
The American Society of Mechanical Engineers

A

ADVERTISING

Gibson, Geo. H., Tribune Bldg., New York.
Michel & Staff, A. Eugene, 116 Nassau St., New York.

AERONAUTICAL

Fellers, William M., Box 969, Jacksonville, Fla.
Monte, Robert Alva, 149 Commerce St., Newark, N. J.
Roberts, G. B., 301 W. Chase St., Pensacola, Fla.
AERONAUTICAL MOTOR MANUFACTURE
Davis, Charles Ethan, 885 West End Ave., New York.

AMMUNITION PLANT EQUIPMENT

Banks, Frederick R., 1237 Noble Ave., Bridgeport, Conn.

APPRAISALS (See also Valuation)

Carr, Inc., E. W., 425 Gravier St., New Orleans, La.
Colwell, James V. V., 105 W. 40th St., New York.
Day & Zimmermann, Inc., 611 Chestnut St., Philadelphia, Pa.
Fletcher, E. L., Fletcher-Thompson, Inc., Bridgeport, Conn.
Harris, Harry E., P. O. Box 852, Bridgeport, Conn.
Haven, H. M. & Crosby, Wm. W., 40 Court St., Boston, Mass.
Lemley, B. W., 429 Melrose St., Chicago, Ill.
Republic Engineers, Inc., 60 Broadway, New York.
Ryther, Geo. D., Carthage, N. Y.
White Engr. Corp'n, J. G., 43 Exchange Place, New York.

ARCHITECTURAL (See also Mill Architects)
Ancona, John F., Cutler Bldg., Rochester, N. Y.
Ballinger & Perrot, N. W. Cor. 17th and Arch Sts., Philadelphia, Pa.
Cantell, M. T., 108 Union Trust Bldg., Winnipeg, Man., Canada.

AUDITS

Day & Zimmermann, Inc., 611 Chestnut St., Philadelphia, Pa.

AUTOMATIC MACHINERY

Frick, John, 216 Pacific Ave., Atlantic City, N. J.
Lee, William Floyd, 924 Mutual Bldg., Richmond, Va.
Monte, Robert Alva, 149 Commerce St., Newark, N. J.

—Screw Making

Bell, David, 911 Lafayette Ave., Buffalo, N. Y.

AUTOMOBILE MANUFACTURE

Davis, Charles Ethan, 885 West End Ave., New York.

AUTOMOTIVE

Halbass, Arnold J., Princess Bay, S. I., New York.
Myers, Cornelius T., 117 West Fort St., Detroit, Mich.
Reed & Glaser, 1602-3 Merchants Bank, Indianapolis, Ind.

B

BALLISTIC APPARATUS

Kaighn, H. E., 2600 Harrison St., Wilmington, Del.

BEARINGS

Bierbaum, Christopher H., 1011 Mutual Life Bldg., Buffalo, N. Y.

BRASS AND COPPER MILLS

Thompson, W. L., Waterbury, Conn.

BRIDGES

Burr, Wm. H., 120 Broadway, New York.

BUILDING EQUIPMENT

—Electrical

Meyer, Jr., Henry C. and Jones, Basset, Assoc., 101 Park Ave., New York.
Pattison, Frank A., 1182 Broadway, New York.

—Mechanical

Meyer, Jr., Henry C. and Jones, Basset, Assoc., 101 Park Ave., New York.
Pattison, Frank A., 1182 Broadway, New York.

C

CABLES, HIGH TENSION

Adams, Comfort A., 33 W. 39th St., New York.

CABLEWAYS

Hays, Lewis T., 1054-64 Fourth Ave., S., Seattle, Wash.

CAST IRON

Moldenke, Dr. Richard, Watchung, N. J.

CASTINGS, MALLEABLE

Moldenke, Dr. Richard, Watchung, N. J.

CEMENT PLANTS (Portland)

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

CHEMICAL

Brown, Herman E., 15 Westchestnut St., Kingston, N. Y.

Cannon-Swenson Co., 53 W. Jackson Blvd., Chicago, Ill.

Griepe, A. W. N., 707 Prospect Ave., New York.

Jacoby, Henry E., 95 Liberty St., New York.

Klein, Otto H., 368 St. Pauls Ave., Tompkinsville, S. I., N. Y.

Little, Inc., Arthur D., 30 Charles River Road, Cambridge, Mass.

Mantius, Otto, 233 Broadway, New York.

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

Pike, Robt. D., 74 New Montgomery St., San Francisco, Cal.

Robinson, Louis E., 31 E. 4th St., Cincinnati, O.

Sherman, Mason H., 4519 W. Harrison St., Chicago, Ill.

Spackman, Henry S., 2024 Arch St., Philadelphia, Pa.

Wayte, Inc., W. J., 1 Liberty St., New York.

CHEMICAL WORKS

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

Pike, Robt. D., 74 New Montgomery St., San Francisco, Cal.

—Designing

Viola, Bartholomew, 309 Broadway, New York.

CIVIL

Arnold Co., 105 S. La Salle St., Chicago, Ill.

Baker, Charles Whiting, 31 Nassau St., New York.

Bixby, Wm. H., 428 Customhouse, St. Louis, Mo.

Burr, Wm. H., 120 Broadway, New York.

Camp, E. V., Box 421, Atlanta, Ga.

Conrad, W. R., Burlington, N. J.

Cory, Russell G., 39 Cortlandt St., New York.

Elrod, Henry E., Dallas, Texas.

Finkle, Frederick Cecil, 448-449 I. W. Hellman Bldg., Los Angeles, Cal.

Adv

Flad-Humphrey Engrg. Co., 1312 Chemical Bldg., St. Louis, Mo.
 Fry, Alfred Brooks, Navy Yard, New York.
 Gerhard, Dr. Wm. Paul, 17 W. 42nd St., New York.
 Hazen, Whipple & Fuller, 30 E. 42nd St., New York.
 Hodge, Harry S., University, Va.
 Holland, Ackerman & Holland, Lawrence Bldg., Ann Arbor, Mich.
 Just, George A., 239 Vernon Ave., Long Island City, N. Y.
 Landreth, Olin H., Union College, Schenectady, N. Y.
 Moran, Daniel E., 55 Liberty St., New York.
 Newell, F. H., Urbana, Ill.
 Republic Engineers, Inc., 60 Broadway, New York.
 Salisbury, Royal D., 1415 E. Colfax Ave., Denver, Colo.
 Sanderson & Porter, 52 William St., New York.
 Spence, Peter C., 70 W. 71st St., New York.
 Swain, Geo. T., Mass. Inst. Technology, Boston, Mass.
 Webster, Wm. R., 411 Walnut St., Philadelphia, Pa.
 Wilcox, Ralph M., Middletown, Conn.
COAL CRUSHING
 Hiller, Joseph L., 21 S. 12th St., Philadelphia, Pa.
COAL HANDLING PLANTS (Designing)
 Lang, Wm. H., 343 S. Dearborn St., Chicago, Ill.
COAL PREPARATION
 Hiller, Joseph L., 21 S. 12th St., Philadelphia, Pa.
COAL SCREENS
 Krehbiel Co., 1712 Marquette Bldg., Chicago, Ill.
COAL TIPPLES
 Krehbiel Co., 1712 Marquette Bldg., Chicago, Ill.
COAL WASHING
 Hiller, Joseph L., 21 S. 12th St., Philadelphia, Pa.
COKE PLANT EQUIPMENT
 Hiller, Joseph L., 21 S. 12th St., Philadelphia, Pa.
COMMERCIAL DEVELOPMENT
 Gibson, Geo. H., Tribune Bldg., New York.
COMBUSTION
 American Industrial Engrg. Co., Monadnock Block, Chicago, Ill.
 Greist, A. O., 233 Broadway, New York.
 Little & Shepard, 2033 Dime Bank Bldg., Detroit, Mich.
 Lucke, Charles E., Columbia University, New York.
 Misostow, H., 615 N. Michigan Ave., Chicago, Ill.
 Pfisterer, G. E., 1450 Old Colony Bldg., Chicago, Ill.
 Pittsford, W. A., 229 N. Central Ave., Chicago, Ill.
 Rees, E., 1037 Irving Park Blvd., Chicago, Ill.
 Rodgers, H. P., 2099 E. 71st St., Cleveland, O.
CONCRETE
 Roelker, C. J., 924 Mutual Bldg., Richmond, Va.
CONCRETE SHIPS
 Godfrey, Hollis, 32nd & Chestnut Sts., Philadelphia, Pa.
CONSTRUCTING
 Arnold Co., 105 S. La Salle St., Chicago, Ill.
 Conard, W. R., Burlington, N. J.
 Kiddle & Co., Walter, 140 Cedar St., New York.
 Stone & Webster, 147 Milk St., Boston, Mass.
 Westcott & Mapes, 207 Orange St., New Haven, Conn.
CONSULTATION
 Haven, H. M. & Crosby, Wm. W., 40 Court St., Boston, Mass.
CONTRACTING
 Bennett, Howard D., 2114 Allendale St., Baltimore, Md.
 McKee & Co., Arthur G., Rockefeller Bldg., Cleveland, O.
 White Engrg. Corp'n, J. G., 43 Exchange Place, New York.
CONVEYING
 Buckley, Capt. John H., P. O. Box No. 335, Yonkers, N. Y.

Cundall, Powell & Mosher, 80 W. Genesee St., Buffalo, N. Y.
 Farnham, Bion B., 31-39 Indiana St., Buffalo, N. Y.

COSTS

Battin, Harold T., Truell Court, Plainfield, N. J.
 Kidder, Walter M., 143 W. 82nd St., New York.
 Margin, Howard, Dayton, O.

Scovell, Clinton H., 110 State St., Boston, Mass.
 Smith, Gershom, cr Quarter Master General, 1800 Virginia Ave., Washington, D. C.

COTTON SEED CRUSHING MACHINERY

Neale, William McC., P. O. Box 825, Greensboro, N. C.

CRANES, CABLE

Hays, Lewis T., 1054-64 Fourth Ave., S., Seattle, Wash.

CRANES AND HOISTS

Kinney, J. N., 30 Church St., New York.

CUPOLAS

Robinson, Louis E., 31 E. 4th St., Cincinnati, O.

D**DEHYDRATING PLANTS**

Goubert, Aug. A., 80 West St., New York.

DESIGNING (See also Chemical Works, Coal Handling Machinery, Electrical Machinery, Engines, Industrial Plants, Machinery, Power Plants, Structural, Tools)
 Buckley, Capt. John H., P. O. Box 335, Yonkers, N. Y.

Moody, W. F., 6 Boston Bldg., Denver, Colo.
 Nikonow, J. P., 1301 Vanderbilt Concourse Bldg., New York.
 White Engrg. Corp'n, J. G., 43 Exchange Place, New York.

DRAINAGE AND RECLAMATION
 White Engrg. Corp'n, J. G., 43 Exchange Place, New York.

DREDGES

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

DUST COLLECTION

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

E**EFFICIENCY**

Cadwallader, Jr., H., 1413 Somerset St., Philadelphia, Pa.

Kidder, Walter M., 143 W. 82nd St., New York.
 Scovell, Wellington & Co., 110 State St., Boston, Mass.

Shepard, George H., Industrial Dept., Navy Yard, Norfolk, Va.

ELECTRIC WELDING

Adams, Comfort A., 33 W. 39th St., New York.

ELECTRICAL

Adams, Comfort A., 33 W. 39th St., New York.
 Arnold Co., 105 S. La Salle St., Chicago, Ill.

Ballinger & Perrot, N. W. Cor. 17th and Arch Sts., Philadelphia, Pa.

Brown & Co., Edward C., 207 Essex St., Boston, Mass.

Camp, E. V., Box 421, Atlanta, Ga.

Coghlin, J. P., 259 Main St., Worcester, Mass.
 Cory, Russell G., 39 Cortlandt St., New York.

Eadie, Freund & Campbell, 7 W. 45th St., New York.

Engineering Sales Co., Inc., New Orleans, La.
 Fletcher, E. L., Fletcher-Thompson, Inc., Bridgeport, Conn.

Franz, Walter G., Union Trust Bldg., Cincinnati, O.

Griswold, H. J., 320 Lagauchetiere St., West Montreal, Canada.

Hatch, Edwin Glentworth, Equitable Bldg., New York.

ELECTRICAL (Continued)

Holland, Ackerman & Holland, Lawrence Bldg., Ann Arbor, Mich.
 Hollis, French & Allen Hubbard, 88 Pearl St., Boston, Mass.
 Hopkins, Nevil Monroe, 2128 Bancroft Place, Washington, D. C.
 Hoxie, Geo. L., 50 East 41st St., New York.
 Humphrey, C. W., 327 S. La Salle St., Chicago, Ill.
 Hutchinson, Cary T., 40 Wall St., New York.
 Kiehl, Eugene P., Oak Lane, Philadelphia, Pa.
 Maxfield, Lewis S., P. O. Box 368, Islip, N. Y.
 Meron, Frederic, U. S. Govt. Explosives Plant "C," Nitro, W. Va.
 Meyer, Jr., Henry C. and Jones, Basset, Assoc., 101 Park Ave., New York.
 Pillsbury Co., Charles L., 813 Metropolitan Life Bldg., Minneapolis, Minn.
 Place, Clyde R., Grand Central Terminal, New York.
 Polek & Co., J., 2321 Hughes St., Brooklyn, N. Y.
 Raymond, Alfred, 1324 Nashville Ave., New Orleans, La.
 Republic Engineers, Inc., 60 Broadway, New York.
 Rushmore, David Barker, Schenectady, N. Y.
 Salisbury, Royal D., 1415 E. Colfax, Denver, Colo.
 Sanderson & Porter, 52 William St., New York.
 Sanford, Frank, 607 Credit Foncier Bldg., Vancouver, B. C.
 Scott, Arthur C., 601 Praetorian Bldg., Dallas, Texas.
 Smith, Harold B., Polytechnic Institute, Worcester, Mass.
 Stone & Webster, 147 Milk St., Boston, Mass.
 Weeks, Robert W., 1st Lieut. Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md.
 Westcott & Mapes, 207 Orange St., New Haven, Conn.
 White Engrg. Corp'n, J. G., 43 Exchange Place, New York.
 Whiting, Charles W., 148 State St., Boston, Mass.
 Woolfolk, Wm. G., 72 West Adams St., Chicago, Ill.

ELECTRICAL EQUIPMENT

Schloss, Newton L., 25 W. 32nd St., New York.

ELECTRICAL INSTALLATIONS

Acheson, A. R., 852 Ostrom Ave., Syracuse, N. Y.
 Polek & Co., J., 2321 Hughes St., Brooklyn, N. Y.

ELECTRICAL MACHINERY (Designing)

Adams, Comfort A., 33 W. 39th St., New York.

ELECTRO-CHEMICAL

Franklin, Milton W., 1422—68th Ave., Oak Lane, Philadelphia, Pa.

ENGINES**—Gas**

Dock, Herman, Engineers' Club, New York.

—Gas (Designing)

Illmer, Louis, 22 Paul St., Newton Centre, Mass.

—Internal Combustion

Lucke, Charles E., Columbia University, New York.

EQUIPMENT (See also Ammunition Plants; Building, Coke Plants, Electrical, Industrial Plants, Interchangeable Tool, Petroleum Distilling, Railway, Sprinkler)
 Buckley, Capt. John H., P. O. Box 335, Yonkers, N. Y.

Colwell, James V. V., 105 W. 40th St., New York.

EVAPORATORS

Mantius, Otto, 233 Broadway, New York.

EXAMINATIONS AND REPORTS (See also Investigations)

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

Brinton, Willard C., 7 E. 42nd St., New York.
 Collins, Hubert E., 132 Boyce Ave., Utica, N. Y.

Day & Zimmermann, Inc., 611 Chestnut St., Philadelphia, Pa.

Fletcher, E. L., Fletcher-Thompson, Inc., Bridgeport, Conn.

Gilbreth, Inc., Frank B., 77 Brown St., Providence, R. I.

White Engrg. Corp'n, J. G., 43 Exchange Place, New York.

EXCAVATING

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

EXPERIMENTAL

Monte, Robert Alva, 149 Commerce St., Newark, N. J.

EXPLOSIVES

Kaighn, H. E., 2600 Harrison St., Wilmington, Del.

EXPLOSIVES PLANTS

Kaighn, H. E., 2600 Harrison St., Wilmington, Del.

F**FACTORIES (See also Sugar)****—Management**

Lloyd, Robert McAllister, 347 Madison Ave., New York.

Wilcox, H. M., 153 Livingston St., New Haven, Conn.

—Organization

Doble, William A., 190 Sea Cliff Ave., San Francisco, Cal.

Lloyd, Robert McAllister, 347 Madison Ave., New York.

—Planning

Cundall, Powell & Mosher, 80 W. Genesee St., Buffalo, N. Y.

FIELD RESEARCH WORK

Fowler, Geo. L., 83 Fulton St., New York.

Peterson & Co., Frank P., Tulsa, Okla.

FILTRATION PLANTS**—Chemical**

Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.

—Sugar

Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.

—Wax

Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.

FIRE PREVENTION

Ancona, John F., Cutler Bldg., Rochester, N. Y.

Davis, Charles Ethan, 885 West End Ave., New York.

Hoagland, Ira G., 80 Maiden Lane, New York.

FORGE SHOPS

Ellis, Frank L., 2126 Farmers Bank Bldg., Pittsburgh, Pa.

FOUNDATIONS

Burr, Wm. H., 120 Broadway, New York.

FOUNDRY PLANTS

Lane Co., H. M., 701 Owen Bldg., Detroit, Mich.

Moldenke, Dr. Richard, Watchung, N. J.

Moore & Co., W. E., 706 Union Bank Bldg., Pittsburgh, Pa.

Murphy, Jas. A., Hamilton, O.

Robinson, Louis E., 31 E. 4th St., Cincinnati, O.

FURNACES, INDUSTRIAL

Hadley, F. V., 50 Congress St., Boston, Mass.

Lane Co., H. M., 701 Owen Bldg., Detroit, Mich.

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

Schwab, Gustav, 525 Market St., San Francisco, Cal.

G**GAS**

Garland, C. M., 729 First National Bank Bldg., Chicago, Ill.

Hayward, Harold A., 227 Fulton St., New York.

Humphreys & Miller, Inc., 165 Broadway, New York.

Illmer, Louis, 22 Paul St., Newton Centre, Mass.

Jones, Edward C., 445 Sutter St., San Francisco, Cal.

Polk, Roger W., 1601 City Hall Sq. Bldg., Chicago, Ill.
 Steere Engineering Co., Detroit, Mich.

GAS AND OIL

Scott, Arthur C., 601 Praetorian Bldg., Dallas, Texas.

GAS WASHING

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

GASOLINE FROM NATURAL GAS

Biddison, P. McDonald, 52 W. Gay St., Columbus, O.

Peterson & Co., Frank P., Tulsa, Okla.

GASOLINE PLANTS

Fink, J. B., P. O. Box 578, Tulsa, Okla.

GEARS, SPEED REDUCTION

Gardiner, H. Lewis, 2409 Guilford Ave., Baltimore, Md.

GEOLOGICAL

Scott, Arthur C., 601 Praetorian Bldg., Dallas, Texas.

GYROSCOPIC

Norden, Carl L., 375 Fulton St., Room 50, New York.

H

HANDLING AND PACKING MACHINERY

Neale, William McC., P. O. Box 825, Greensboro, N. C.

HEAT TREATING

Epstein, M. K., 703 Lincoln Bldg., Philadelphia, Pa.

Hadley, F. V., 50 Congress St., Boston, Mass.

HEATING

Boomhower, F. K., Marquette Bldg., Detroit, Mich.

Franz, Walter G., Union Trust Bldg., Cincinnati, O.

Little & Shepard, 2033 Dime Bank Bldg., Detroit, Mich.

Stevens, John A., 8 Merrimack St., Lowell, Mass.

HEATING AND VENTILATING

Acheson, A. R., 852 Ostrom Ave., Syracuse, N. Y.

Ancona, John F., Cutler Bldg., Rochester, N. Y.

Balling & Perrot, N. W. Cor. 17th and Arch Sts., Philadelphia, Pa.

Carr, Inc., E. W., 425 Gravier St., New Orleans, La.

Cundall, Powell & Mosher, 80 W. Genesee St., Buffalo, N. Y.

Eastern Machinery & Equipment Co., Inc., 1036 Commercial Trust Bldg., Philadelphia, Pa.

English Co., William T., 308-310 Dover St., Boston, Mass.

Goubert, Aug. A., 90 West St., New York.

Hoffman, J. D., Purdue University, Lafayette, Ind.

Hollis, French & Allen Hubbard, 88 Pearl St., Boston, Mass.

Jones, W. R., 550 S. 48th St., Philadelphia, Pa.

Kimball, D. D., 15 W. 38th St., New York.

McCann, Frank G., 500 Park Ave., New York.

Pillsbury Co., Charles L., 813 Metropolitan Life Bldg., Minneapolis, Minn.

Richmond Engineering Co., Richmond, Va.

Schloss, Newton L., 25 W. 32nd St., New York.

—Public Buildings

McCann, Frank G., 500 Park Ave., New York.

HEATING SYSTEMS, VACUUM

English Co., William T., 308-310 Dover St., Boston, Mass.

HOISTING

Buckley, Capt. John H., P. O. Box 335, Yonkers, N. Y.

HOTELS

Place, Clyde R., Grand Central Terminal, New York.

HYDRAULIC

Allen, Charles M., Boynton St., Worcester, Mass.

Burr, Wm. H., 120 Broadway, New York.

Doble, William A., 190 Sea Cliff Ave., San Francisco, Cal.

Groat, B. F., 2400 Oliver Bldg., Pittsburgh, Pa.

Hale, Richard A., Lawrence, Mass.

Hall, Robert E., 12 S. Clinton St., Chicago, Ill.

Holland, Ackermann & Holland, Lawrence Bldg., Ann Arbor, Mich.

Hollis, French & Allen Hubbard, 88 Pearl St., Boston, Mass.

Hornung, Geo., 512 Fairfield Ave., Bellevue, Ky.

Johnson, R. D., 60 Wall St., New York.

Landreth, Olin H., Union College, Schenectady, N. Y.

Scott, Arthur C., 601 Praetorian Bldg., Dallas, Texas.

Switzer, John A., University of Tennessee, Knoxville, Tenn.

White Engrg. Corp'n, J. G., 43 Exchange Place, New York.

HYDRAULIC MACHINERY

Monte, Robert Alva, 149 Commerce St., Newark, N. J.

HYDRAULIC SHELL FORGING

Davis, Charles Ethan, 885 West End Ave., New York.

HYDRO-ELECTRIC DEVELOPMENT

Hoxie, Geo. L., 60 East 41st St., New York.

I

ILLUMINATING

Le Page, Clifford B., Stevens Institute of Technology, Hoboken, N. J.

INDUSTRIAL

Alsberg, Julius, 7 So. Dearborn St., Chicago, Ill.

Breslove, Joseph, 985 Union Arcade, Pittsburgh, Pa.

Brown, Wendell S., 603 Industrial Trust Bldg., Providence, R. I.

Cartmell, N. Madison, N. Y. University School of Commerce, New York.

Chase, Inc., Frank D., Peoples Gas Bldg., Chicago, Ill.

Collins, Francis W., 50 Church St., New York.

Cooley & Marvin Co., 708-713 Tremont Bldg., Boston, Mass.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Day & Zimmermann, Inc., 611 Chestnut St., Philadelphia, Pa.

Diemer, Hugo, Lowell, Mass.

Edgar, O. N., Box 1388, Houston, Texas.

Feiss, Richard A., 2149 West 53rd St., New York.

Firestone, T., 1003-5 Granite Bldg., Rochester, New York.

Fletcher, E. L., Fletcher-Thompson, Inc., Bridgeport, Conn.

Halbfass, Arnold J., Princess Bay, S. I., New York.

Lee, William Floyd, 924 Mutual Bldg., Richmond, Va.

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

Mering, Barclay G., 400 Fletcher Natl. Bank Bldg., Indianapolis, Ind.

Minich, Henry D., Cannon Place, Troy, N. Y.

Moore, Harold T., 611 Chestnut St., Philadelphia, Pa.

Ott, Albert J., 32 N. Clinton St., Chicago, Ill.

Pratt, Frederick R., 106 Cross St., Central Falls, R. I.

Rich, Edward R., Manhattan Bldg., Chicago, Ill.

Rockwell, Willard F., 16508 Euclid Ave., Cleveland, O.

Scovell, Clinton H., 110 State St., Boston, Mass.

Sheldon & Son, F. P., 603 Industrial Trust Bldg., Providence, R. I.

Shepard, George A., Industrial Dept., Navy Yard, Norfolk, Va.

Thompson, Jr., Inc., Uldric, 120 Broadway, New York.

Ulreks and Johnson, 78 Devonshire St., Boston, Mass.

Wallace & Co., Joseph H., Temple Court Bldg., New York.

Ind

INDUSTRIAL (Continued)

White Engrg. Corp'n, J. G., 43 Exchange Place, New York.
 Wilcox, H. M., 153 Livingston St., New Haven, Conn.
 Yeomans, Lucien I., 72 W. Adams St., Chicago, Ill.

INDUSTRIAL PLANTS

Ancona, John F., Cutler Bldg., Rochester, N. Y.
 Brinton, Willard C., 7 E. 42nd St., New York.
 Cannon-Swenson Co., 53 W. Jackson Blvd., Chicago, Ill.
 Day & Zimmermann, Inc., 611 Chestnut St., Philadelphia, Pa.
 Engel Sr. Construction Co., Godfrey, 30 Church St., New York.
 Haven, H. M. & Crosby, Wm. W., 40 Court St., Boston, Mass.
 Hollis, French & Allen Hubbard, 88 Pearl St., Boston, Mass.
 Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.
 Lane Co., H. M., 701 Owen Bldg., Detroit, Mich.
 Main, Charles T., 201 Devonshire St., Boston, Mass.
 Place, Clyde R., Grand Central Terminal, New York.
 Wood, A. C., Stock Exchange Bldg., Philadelphia, Pa.

—Designing

Viola, Bartholomew, 309 Broadway, New York.

—Equipment

Case, Willard L., 17 Battery Pl., New York.

—Equipment (Hydraulic)

Eastern Machinery & Equipment Co., Inc., 1036 Commercial Trust Bldg., Philadelphia, Pa.

INLAND WATERWAYS

Godfrey, Hollis, 32nd & Chestnut Sts., Philadelphia, Pa.

Ind INSPECTION

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

Colwell, James V. V., 105 W. 40th St., New York.

Conard, W. R., Burlington, N. J.

Eastern Machinery & Equipment Co., Inc., 1036 Commercial Trust Bldg., Philadelphia, Pa.

Gebhardt, G. F., Armour Inst. of Technology, Chicago, Ill.

Lea, E. S., 229 Chestnut Ave., Trenton, N. J.

INSULATING MATERIALS

Pike, Robt. D., 74 New Montgomery St., San Francisco, Cal.

INTERCHANGEABLE TOOL EQUIPMENT

Barnes, William O., Leominster, Mass.

INVESTIGATIONS (See also Examinations and Reports)

Collins, Hubert E., 132 Boyce Ave., Utica, N. Y.

Davis, Charles Ethan, 885 West End Ave., New York.

Harris, Harry E., P. O. Box 852, Bridgeport, Conn.

Lloyd, Robert McAllister, 347 Madison Ave., New York.

Perkins, George H., Lowell, Mass.

—Public Utilities

Polakov, Walter N., 31 Nassau St., New York.

K**KILNS****—Drying**

Goubert, Aug. A., 90 West St., New York.

—Lime

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

—Oil Extracting

Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.

—Reduction

Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.

—Revivifying

Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.

L**LAND RECLAMATION**

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

LAYOUT**—Foundry**

Lane Co., H. M., 701 Owen Bldg., Detroit, Mich.

—Marine Plants

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

—Plants

Brinton, Willard C., 7 E. 42nd St., New York.
 Thompson, Jr., Inc., Uldric, 120 Broadway, New York.

LIGHTING

Stevens, John A., 8 Merrimack St., Lowell, Mass.

—Street

Acheson, A. R., 852 Ostrom Ave., Syracuse, N. Y.

LUBRICATION

Peterson, J. Wm., 122 Reservoir Ave., Milwaukee, Wis.

Wood, Robert, 15 Hawthorne St., Brooklyn, N. Y.

LUMBER DRYING

Grand Rapids Veneer Works, Grand Rapids, Mich.

M**MACHINE TOOLS****—Manufacture**

Davis, Charles Ethan, 885 West End Ave., New York.

MACHINERY DESIGNING

Adler, Alphonse A., 85 Livingston St., Brooklyn, N. Y.

Benner, H. L., N. E. Cor. Fairhill & Huntingdon Sts., Philadelphia, Pa.

Bornhorst, August H., 1st Lieut. Sig. R. C., Avia. Sec., Oso, Wash.

Brown, Herman E., 15 Westchestnut St., Kingston, N. Y.

Bryant, George F., 58th & Filmore Sts., Chicago, Ill.

Cummings, Henry H., 110 High St., Boston, Mass.

Cundall, Powell & Mosher, 80 W. Genesee St., Buffalo, N. Y.

Deverell, Spencer & Co., Garrett Bldg., Baltimore, Md.

Dock, Herman, Engineers' Club, New York.

Fermier, E. J., College Station, Tex.

Furman, F. de R., Stevens Institute of Technology, Hoboken, N. J.

Gardiner, H. Lewis, 2409 Guilford Ave., Baltimore, Md.

Gooding, Charles S., 27 School St., Boston, Mass.

Harris, Harry E., P. O. Box 852, Bridgeport, Conn.

Haynes, James L., 42 Pacific St., New London, Conn.

Holdridge, C. A., 338 Baldwin Ave., Detroit, Mich.

Lloyd, Robert McAllister, 347 Madison Ave., New York.

Monte, Robert Alva, 149 Commerce St., Newark, N. J.

Neale, William McC., P. O. Box 825, Greensboro, N. C.

Norden, Carl L., 375 Fulton St., Room 50, New York.

Penney, Harold D., 9 Murray St., New York.

Polek & Co., J., 2321 Hughes St., Brooklyn, N. Y.

Rantenstrach, Walter, 117th St. & Broadway, New York.

Ryther, Geo. D., Carthage, N. Y.

Slocum, Avram and Slocum, Inc., 30 Pine St., New York.

Taylor, Percy B., Essex Bldg., Newark, N. J.

Wunsch & Washburn, 207 Centre St., New York.

MAGNESITE PRODUCTS

Pike, Robt. D., 74 New Montgomery St., San Francisco, Cal.

MANAGEMENT (See also Factories, Mines, Power Plants, Public Utilities, Shop)

Brinton, Willard C., 7 E. 42nd St., New York.
Butler, J. F., Bayside, L. I., New York.

Cartmell, N. Madison, N. Y. University School of Commerce, New York.

Case, Willard L., 17 Battery Pl., New York.

Clark C., Elbert, 6th Floor, Glenny Bldg., Rochester, N. Y.

Colwell, James V., 105 W. 40th St., New York.

Conard, W. R., Burlington, N. J.

Cooley & Marvin Co., 708-713 Tremont Bldg., Boston, Mass.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Davis, Charles Ethan, 885 West End Ave., New York.

Doble, William A., 190 Sea Cliff Ave., San Francisco, Cal.

Dock, Herman, Engineers' Club, New York.

Fleming, Henry Stuart, 1 Broadway, New York.

Gilbreth, Inc., Frank B., 77 Brown St., Providence, R. I.

Hall, Keppeler, Lieut.-Col. Ord., Army War College, Washington, D. C.

Hannah, Frederick A., 32 W. 40th St., New York.

Holdridge, C. A., 338 Baldwin Ave., Detroit, Mich.

Polakov, Walter N., 31 Nassau St., New York.

Rantenstrauch, Walter, 117th St. & Broadway, New York.

Ray, Martin H., Army Aviation School, San Diego, Calif.

Shepard, George H., Industrial Dept., Navy Yard, Norfolk, Va.

Slocum, Avram and Slocum, Inc., 30 Pine St., New York.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Thompson & Lichtner, 136 Federal St., Boston, Mass.

Bell, David, 911 Lafayette Ave., Buffalo, N. Y.

Bendit, Louis, Chelsea, Okla.

Benedict, J. G., Waynesboro, Pa.

Benjamin, C. H., Purdue University, Lafayette, Ind.

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

Bentley & Holmgren, 406 Court Exchange Bldg., Bridgeport, Conn.

Berry, A. O., I. C. C., Chattanooga, Tenn.

Best, Wm. Newton, 11 Broadway, New York

Biddison, P. McDonald, 52 W. Gay St., Columbus, O.

Bierbaum, Christopher H., 1011 Mutual Life Bldg., Buffalo, N. Y.

Bird, Paul P., 111 W. Monroe St., Chicago, Ill.

Blackburn, A. H., 1807 Harris Trust Bldg., Chicago, Ill.

Blakeley, Gerald W., 400 Charles River Road, Cambridge, Mass.

Blanchard, R. K., 50 E. 42nd St., New York.

Block, Lewis, 45 E. 42nd St., New York.

Bodowski, Alfred, Pittsburgh, Pa.

Bolton, Reginald P., 55 Liberty St., New York.

Bonine, Charles E., 20 S. 15th St., Philadelphia, Pa.

Boomhower, F. K., Marquette Bldg., Detroit, Mich.

Borge, Incinerator Corp'n, 1216 Flatiron Bldg., New York.

Bornhorst, August H., 1st Lieut. Sig. R. C., Avia. Sec., Oso, Wash.

Boyd, F. F., Lieut. U. S. Submarine Base, New London, Conn.

Brett, Henry E., 533 Higgins Bldg., Los Angeles, Cal.

Breul, G. Fred, Bridgeport, Conn.

Briggs, C. A., Bureau of Standards, Washington, D. C.

Brightman, Howard L., Columbus, Ohio.

Brill, Geo. M., 140 N. Broad St., Philadelphia, Pa.

Briner, E. A., 370 Central Ave., E. Orange, N. J.

Broom, Benjamin A., 642 Davidson Bldg., Sioux City, Iowa.

Brown & Co., Edward C., 207 Essex St., Boston, Mass.

Brown, Herman E., 15 Westchestnut St., Kingston, N. Y.

Bryant, George F., 58th & Filmore Sts., Chicago, Ill.

Buckley, Capt. John H., P. O. Box 335, Yonkers, N. Y.

Bunnell, S. H., 24 State St., New York.

Burr, E. M., Champaign, Ill.

Butler, J. F., Bayside, L. I., New York.

Camp, E. V., Box 421, Atlanta, Ga.

Cannon-Swenson Co., 53 W. Jackson Blvd., Chicago, Ill.

Carey, James L., 208 N. Laramie Ave., Chicago, Ill.

Carr, Inc., E. W., 425 Gravier St., New Orleans, La.

Case, Willard L., 17 Battery Pl., New York.

Chandler, R. E., 1606 W. University Ave., Gainesville, Fla.

Chisholm, John J., 2122 Penniston St., New Orleans, La.

Clarke, Arthur F., 145 Franklin St., Boston, Mass.

Cleaton Corp'n, R. E., 20 St. Nicholas St., Montreal, P. Q., Canada.

Clegg, Robert Ingham, Caston Bldg., Cleveland, Ohio.

Cleghorn, M. P., 513 Ash Ave., Ames, Ia.

Cocks, Frank L., Glen Cove, L. I.

Collins, Francis W., 50 Church St., New York.

Convery, John J., 19 West 44th St., New York.

Cooley, M. E., Ann Arbor, Mich.

Cooley & Marvin Co., 708-713 Tremont Bldg., Boston, Mass.

Cornell, H. D., 308 Wright Bldg., Tulsa, Okla.

Cory, Russell G., 39 Cortlandt St., New York.

Cuervo, M. V., Cuba St., No. 47, Havana, Cuba.

Cummings, Henry H., 110 High St., Boston, Mass.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Mec

MECHANICAL (Continued)

Mec

- Cundall, Powell & Mosher, 80 W. Genesee St., Buffalo, N. Y.
- Dalley, H. H. Chas., 801 Peoples Gas Bldg., Chicago, Ill.
- Davis, Charles Ethan, 885 West End Ave., New York.
- Davol, Geo. K., 503 Market St., San Francisco, Cal.
- De Lancey, Darragh, 52 Pine St., Waterbury, Conn.
- Deverell, Spencer & Co., Garrett Bldg., Baltimore, Md.
- Diamant, Sidney, 164 Emmett St., Newark, N. J.
- Dock, Herman, Engineers' Club, New York.
- Dodge, Kern, Morris Bldg., Philadelphia, Pa.
- Dreyfus, Edwin D., 1102 Benedum-Trees Bldg., Pittsburgh, Pa.
- Durley, R. J., Plaza Bldg., Ottawa, Canada.
- Durr, H. A., 104 S. Michigan Ave., Chicago, Ill.
- Dyer Co., 2031 Euclid Ave., Cleveland, O.
- Eadie, Freund & Campbell, 7 W. 45th St., New York.
- Eastern Machinery & Equipment Co., Inc., 1036 Commercial Trust Bldg., Philadelphia, Pa.
- Ekstrand, Charles, 79 Wall St., New York.
- Ellis, Frank I., 2126 Farmers Bank Bldg., Pittsburgh, Pa.
- Ellison, Lewis M., 214 W. Kinzie St., Chicago, Ill.
- Engel Sr. Construction Co., Godfrey, 30 Church St., New York.
- Engineering Sales Co., Inc., New Orleans, La.
- English Co., William T., 308-310 Dover St., Boston, Mass.
- Farnham, Bion B., 31-39 Indiana St., Buffalo, N. Y.
- Fassett, Francis K., U. B. Bldg., 1302-3, Dayton, Ohio.
- Fast, G., Baltimore, Md.
- Feldman, A. M., 19 West 44th St., New York.
- Fermier, E. J., College Station, Tex.
- Fernald, R. H., University of Pennsylvania, Philadelphia, Pa.
- Fickes, Alfred C., 547 W. Chestnut St., Lancaster, Pa.
- Fink, J. B., P. O. Box 578, Tulsa, Okla.
- Fish, Charles H., 73 Tremont St., Boston, Mass.
- Fitch, Alfred L., 179 W. Washington St., Chicago, Ill.
- Fitch, Claude E., First National Bank Bldg., Chicago, Ill.
- Flack, Alonzo, 30 Church St., New York.
- Flanner, D. D., 87 Rose Ave., Akron, O.
- Flather, John J., University of Minnesota, Minneapolis, Minn.
- Fletcher, E. L., Fletcher-Thompson, Inc., Bridgeport, Conn.
- Flewelling Jr., Milton F., 128 Huntington Ave., Boston, Mass.
- Forbes, W. D., New London, Conn.
- Fowler, Geo. L., 83 Fulton St., New York.
- Francis & Co., Walter J., 260 St. James St., Montreal, Canada.
- Franz, Walter G., Union Trust Bldg., Cincinnati, O.
- Frick, John, 216 Pacific Ave., Atlantic City, N. J.
- Friedman, Ferdinand J., 105 W. 40th St., New York.
- Fuel Engineering Co. of New York, 106 E. 10th St., New York.
- Furman, F. de R., Stevens Institute of Technology, Hoboken, N. J.
- Gaines, F. F., U. S. Railroad Administration, Southern Bldg., Washington, D. C.
- Galusha, A. L., Sharon, Mass.
- Gardiner, H. Lewis, 2409 Guilford Ave., Baltimore, Md.
- Garland, C. M., 729 First National Bank Bldg., Chicago, Ill.
- Gassman, Howard M., Brown Marx Bldg., Birmingham, Ala.
- Gebhardt, G. F., Armour Inst. of Technology, Chicago, Ill.
- Gibson, Arthur, 1022 Haight St., San Francisco, Cal.
- Gibson, Geo. H., Tribune Bldg., New York.
- Giele, W. S., 15th & Forge Sts., Lebanon, Pa.
- Githens, Thomas F., 561 W. 180th St., New York.
- Gluck, Edward V., 1100 West Farms Road, New York.
- Godfrey, Hollis, 32nd & Chestnut Sts., Philadelphia, Pa.
- Goldie & McCulloch Co., Ltd., Galt, Ont., Can.
- Goldschmidt, Otto E., 116 W. 39th St., New York.
- Gordon, L. A., 19 W. 44th St., New York.
- Gorham, Wm. R., 127 Mission St., San Francisco, Cal.
- Graffam, W. S., 34 Southbridge St., Worcester, Mass.
- Grand Rapids Veneer Works, Grand Rapids, Mich.
- Gratiot, J. T., Casper, Wyo.
- Green, Harold L., 720 Illuminating Bldg., Cleveland, O.
- Green Co., Samuel M., 293 Bridge St., Springfield, Mass.
- Greenwood, T. T., 40 Court St., Boston, Mass.
- Greist, A. O., 233 Broadway, New York.
- Hadley, F. V., 50 Congress St., Boston, Mass.
- Halbfass, Arnold J., Princess Bay, S. I., New York.
- Hall, Chas. R., 555 Elliott Square, Buffalo, New York.
- Hannah, Frederick A., 32 W. 40th St., New York.
- Hanscom, William W., 848 Clayton St., San Francisco, Cal.
- Hanzlik, Henry J., Wellsville, New York.
- Harper, John L., Niagara Falls, N. Y.
- Harris, Ford W., 933 Higgins Bldg., Los Angeles, Cal.
- Harris, Harry E., P. O. Box 852, Bridgeport, Conn.
- Hartshorne, William Davis, 40 Pleasant St., Methuen, Mass.
- Hatch, Edwin Glentworth, Equitable Bldg., New York.
- Hatfield, Robt. L., 207 Market St., Newark, N. J.
- Haven, H. M. & Crosby, Wm. W., 40 Court St., Boston, Mass.
- Hay, Paul L., 907 Phipps Power Bldg., Pittsburgh, Pa.
- Haynes, James L., 42 Pacific St., New London, Conn.
- Hays, Lewis T., 1054-64 Fourth Ave. S., Seattle, Wash.
- Hayward, H. W., Mass. Inst. Technology, Cambridge, Mass.
- Hefner & Maysilles, Grafton, W. Va.
- Herschmann, Arthur J., Watchung, N. J.
- Hibbard, H. Wade, Columbia, Mo.
- Hibbard, R. L., Jenkins Arcade Bldg., Pittsburgh, Pa.
- Hill, Anthony S., 90 West St., New York.
- Hiller, Joseph L., 21 S. 12th St., Philadelphia, Pa.
- Hoagland, Ira G., 80 Maiden Lane, New York.
- Holdridge, C. A., 338 Baldwin Ave., Detroit, Mich.
- Hollis, French & Allen Hubbard, 88 Pearl St., Boston, Mass.
- Holmes, Frederick S., 2 Rector St., New York.
- Honolulu Iron Works Co., 233 Broadway, New York.
- Houston, Harold A., 3336 Lexington St., Chicago, Ill.
- Hull, J. D., 354 Colman Bldg., Seattle, Wash.
- Humphrey Gas Pump Co., 401 S. A. & K. Bldg., Syracuse, N. Y.
- Hutchinson, Miller Reese, Orange, N. J.
- Irvin, Richard, 105 Vandergriff Bldg., Pittsburgh, Pa.
- Irwin, Oliver C., 291 Broadway, New York.
- Isham, A. K., 4609 14th Ave., N. W., Seattle, Wash.
- Iwanami, Takao, 3332 Olinville Ave., Williamsbridge, New York.
- Jackson, E. R., 1st Lieut. Ord. Officers' Res. Corps, Inspection Division, Ord. Dept., U. S. A.
- Jackson, T. J., 9300 Detroit Ave., Cleveland, O.
- Jay, Jr., Edward G., 1714 Delancey St., Philadelphia, Pa.
- Jellett Co., Stewart A., 1718 Real Estate Trust Bldg., Philadelphia, Pa.
- Jenks, Richard P., 735 Grosvenor Bldg., Providence, R. I.
- Johnson, Paul F., Altadena, Cal.

Johnston, J. Ambler, 707 Chamber Concourse Bldg., Richmond, Va.
 Johnstone, Francis W., 117 N. 14th St., Fort Smith, Ark.
 Jones, Irley E., Dayton, O.
 June, Robert, 1755 W. Grand Blvd., Detroit, Mich.
 Juthie, Kristian A., 128 Sidney St., Cambridge, Mass.
 Keilholz, P. O., Continental Bldg., Baltimore, Md.
 Kelly, Thomas C., 405—2nd Natl. Bank Bldg., Cincinnati, O.
 Kennedy, Walter, Bessemer Bldg., Pittsburgh, Pa.
 Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.
 Kidd, Jr., Andrew, 95 Liberty St., New York.
 Kinney, J. N., 30 Church St., New York.
 Krause, Arthur E., 25 Morris Ave., Mountain Lakes, N. J.
 Krehbiel Co., 1712 Marquette Bldg., Chicago, Ill.
 Kryzanowsky, C. J., 333 Calvert Bldg., Baltimore, Md.
 Kuss, Robert H., Suite 801-112 W. Adams St., Chicago, Ill.
 Lacazette, A. A., Havana St., No. 78, Havana, Cuba.
 Ladd, James B., 1011 Chestnut St., Philadelphia, Pa.
 Land, Wm. H., 343 S. Dearborn St., Chicago, Ill.
 Landt, J. Lefferts, Syracuse, N. Y.
 Langford, George, Joliet, Ill.
 Lannon, John D., 870 Broad St., Bridgeport, Conn.
 Lauer, Herbert H., Allentown, Pa.
 Lawton, M. A., 221 High St., Boston, Mass.
 Lea, E. S., 229 Chestnut Ave., Trenton, N. J.
 Lee, William Floyd, 924 Mutual Bldg., Richmond, Va.
 Leoni, A. M., P. O. Box 574, Dayton, O.
 Lewis, Jr., D. J., 1 Liberty St., New York.
 Lewis, Joseph E., 1601 Moreland Ave., Baltimore, Md.
 Lewis, Thornton, 1302 Land Title Bldg., Philadelphia, Pa.
 Lewis, Warren B., Providence, R. I.
 Libby, Wm. L., Capt. Ord. Production Div., Plant Section, 6th & B St., Washington, D. C.
 Lichtner, William O., 136 Federal St., Boston, Mass.
 Lide, Martin J., 905-6 Woodward Bldg., Birmingham, Ala.
 Little & Shepard, 2033 Dime Bank Bldg., Detroit, Mich.
 Lloyd, Robert McAllister, 347 Madison Ave., New York.
 Loomis, Everts G., 229 Mulberry St., Newark, N. J.
 Loss, Henrik V., 1510 Walnut St., Philadelphia, Pa.
 Loun, E. Julius, Laporte, Ind.
 Lovell, Alfred, 619 Harrison Bldg., Philadelphia, Pa.
 Lucke, Charles E., Columbia University, New York.
 Lynd, Roy E., 406 W. Grace St., Richmond, Va.
 Lynn, Thomas H., 513 First Nat'l Bank Bldg., Williamsport, Pa.
 McDervitt, Frank J., Railway Exch. Bldg., St. Louis, Mo.
 McDonald, Albert, 101 Park Ave., New York.
 McHollan, A., 55 Liberty St., New York.
 McLaren, A. R., 2377 Filbert St., San Francisco, Cal.
 McMullin, F. V., 756 N. 44th St., Philadelphia, Pa.
 Main, Charles T., 201 Devonshire St., Boston, Mass.
 Malm Engineering Co., 588 Drexel Bldg., Philadelphia, Pa.
 Mantius, Otto, 233 Broadway, New York.
 Marburg Brothers, Inc., 90 West St., New York.
 Marks, Lionel S., 192 Brattle St., Cambridge, Mass.
 Marshall, Norman, 107 Chestnut St., West Newton, Mass.

Marvin, Howard, Dayton, O.
 Maxfield, Lewis S., P. O. Box No. 368, Islip, N. Y.
 Meaker, Guy L., 2 Knapp Bldg., Joliet, Ill.
 Meron, Frederic, U. S. Govt. Explosives Plant "C," Nitro, W. Va.
 Merrill, J. J., 213 Illinois St., Chicago, Ill.
 Meyer, Jr., Henry C. and Jones, Basset, Assoc., 101 Park Ave., New York.
 Michel, A. Eugene, 116 Nassau St., New York.
 Mickle, Robert T., 430 W. Stafford St., Philadelphia, Pa.
 Mills, Chas., 23 High St., Newton Upper Falls, Mass.
 Misostow, H., 615 N. Michigan Ave., Chicago, Ill.
 Monte, Robert Alva, 149 Commerce St., Newark, N. J.
 Moody, V. D., 90 West St., New York.
 Morford, Thomas E., 17 Battery Place, New York.
 Morrin & Coddington, Phelan Bldg., San Francisco, Cal.
 Morris, Albert Wood, 54 Buckingham St., Springfield, Mass.
 Mowery, H. Weaver, 50 Church St., New York.
 Moyer, James A., State House, Boston, Mass.
 Muckle, Jr., M. R., 220 South Broad St., Philadelphia, Pa.
 Mudge, Sterling W., Pratt Institute, Brooklyn, N. Y.
 Muhlfeld, John E., 30 Church St., New York.
 Neale, William McC., P. O. Box 825, Greensboro, N. C.
 Neiler, Samuel G., Manhattan Bldg., Chicago, Ill.
 Nelson, Alfred C., 416 Rockefeller Bldg., Cleveland, O.
 Newcomb, E. C., N. Scituate, Mass.
 Nicol, Jr., George A., 296 Madison Ave., New York.
 Nikonow, J. P., 1301 Vanderbilt Concourse Bldg., New York.
 Norden, Carl L., 375 Fulton St., Room No. 50, New York.
 Nordin, Arvid, 140 Cedar St., New York.
 Norton, Fred E., 656 Main St., Worcester, Mass.
 Nusbaum, Lee, 1119-21 N. Howard St., Philadelphia, Pa.
 Offutt, M. Webb, 32 W. 40th St., New York.
 Parks & Son, Byron E., 509 Grand Rapids Savings Bldg., Grand Rapids, Mich.
 Parsons Corp'n, G. K., 29 Pine St., New York.
 Parsons, H. de B., 22 William St., New York.
 Pattison, Frank A., 1182 Broadway, New York.
 Paul, C. E., Armour Institute of Technology, 33rd & Federal Sts., Chicago, Ill.
 Pearson, Robert H., Greystone Park, Yonkers, N. Y.
 Penney, Harold D., 9 Murray St., New York.
 Perkins, George H., Lowell, Mass.
 Peterson & Co., Frank P., Tulsa, Okla.
 Peterson, J. Wm., 122 Reservoir Ave., Milwaukee, Wis.
 Pfeffer, John E., 901 Webster Ave., Chicago, Ill.
 Pillsbury Co., Charles L., 813 Metropolitan Life Bldg., Minneapolis, Minn.
 Place, Clyde R., Grand Central Terminal, New York.
 Polson, Joseph A., East Lansing, Mich.
 Pond, Henry O., 25 Bond St., New York.
 Quick, H. P., 35 Nassau St., New York.
 Ramsey, George, 47th Floor, Woolworth Tower, New York.
 Randolph, Frank D., 129 W. Second St., Plainfield, N. J.
 Rantenstrauch, Walter, 117th St. & Broadway, New York.
 Rasmussen, J. E., Station A., Lincoln, Nebr.
 Ray, David H., Forest Hills, L. I.
 Ray, Frederick, 15 Broad St., New York.
 Raymond, Harold, 502 Interstate Bank Bldg., New Orleans, La.
 Rees, E., 1037 Irving Park Blvd., Chicago, Ill.
 Reeve, Sidney A., 120 Broadway, New York.
 Republic Engineers, Inc., 60 Broadway, New York.
 Reynolds, G. Bergen, W. Toronto, Ont. Canada.
 Rice, Arthur L., 537 S. Dearborn St., Chicago, Ill.

Mec

MECHANICAL (Continued)

Rice, Calvin W., 29 W. 39th St., New York.
 Rice, Cyrus Wm., 63rd & Woodland Ave., Philadelphia, Pa.
 Richmond, Harold A., Niagara Club, Niagara Falls, N. Y.
 Roane, R. Royal, 35 Fort Washington Ave., New York.
 Roberts, Odin, 95 Milk St., Boston, Mass.
 Roberts, Thos. H., 1530 N. Broad St., New Orleans, La.
 Robinson, A. W., 14 Phillips Square, Montreal, Canada.
 Rodgers, H. P., 2099 E. 71st St., Cleveland, O.
 Roelker, C. J., 924 Mutual Bldg., Richmond, Va.
 Rogers, Fred E., 25 Church St., New York.
 Rogers, J. Frank, 3312 Redwood Ave., Cleveland Heights, O.
 Romer, A. J., 77 Weequahic Ave., Newark, N. J.
 Roney, William R., 149 Broadway, New York.
 Root, Harold D., 172 N. 17th St., E. Orange, N. J.
 Rose, Fred W., 471-472 Auditorium Bldg., Minneapolis, Minn.
 Rosenzweig, F., 1812-14 Woolworth Bldg., New York.
 Runyon, Frederick O., 845 Broad St., Newark, N. J.
 Russell, James G., 611 Chestnut St., Philadelphia, Pa.
 Ryan, F. J., Finance Bldg., Philadelphia, Pa.
 Ryther, Geo. D., Carthage, N. Y.
 Salisbury, Rayal D., 1415 E. Colfax, Denver, Colo.
 Sanderson & Porter, 52 William St., New York.
 Sawtelle, E. M., 5 Beekman St., New York.
 Schaphorst, W. F., Tribune Bldg., New York.
 Schloss, Newton L., 25 W. 32nd St., New York.
 Schoenborn, William E., McGill Bldg., Washington, D. C.
 Schuetz, F., 50 Church St., New York.
 Schultz, Wm. W., 1st Lieut., 6 University Place, East Orange, N. J.
 Schwab, Gustav, 525 Market St., San Francisco, Cal.
 Scott, Arthur C., 601 Praetorian Bldg., Dallas, Texas.
 Sessions, Frank L., Rockefeller Bldg., Cleveland, O.
 Shaw, E. C., Akron, O.
 Shepard, Geo. R., Niagara Falls, N. Y.
 Sherman, W. D., 222 N. Wilton Place, Los Angeles, Cal.
 Shipley, Grant B., 1053 Century Bldg., Pittsburgh, Pa.
 Silcox, Lewis K., 169 26th St., Milwaukee, Wis.
 Skinner, James D., Capt. Ord. R. C., 945 Main St., Bridgeport, Conn.
 Slocum, Avram and Slocum, Inc., 30 Pine St., New York.
 Smith, Sanford C., 50 Church St., New York.
 Spence, Peter C., 70 W. 71st St., New York.
 Spillman, Harry C., 1537 2nd Ave., Detroit, Mich.
 Sprado, Ralph, 704 American Bank Bldg., Los Angeles, Cal.
 Stee, Rueben M., Valley City, N. Dak.
 Stevens, John A., 8 Merrimack St., Lowell, Mass.
 Stone, E. Wadsworth, 725 Kenmore Place, Brooklyn, N. Y.
 Stone & Webster, 147 Milk St., Boston, Mass.
 Strachan, John E., 5225 Wissahickon Ave., Philadelphia, Pa.
 Street, Clement T., 50 Church St., New York.
 Stucki, A., Oliver Bldg., Pittsburgh, Pa.
 Taylor, A. J., Credit Foncier Bldg., Vancouver, B. C.
 Taylor, Percy B., Essex Bldg., Newark, N. J.
 Teele, Fred Warren, 330 Coristine Bldg., Montreal, Que.
 Tenney, Albert B., 201 Devonshire St., Boston, Mass.
 Thomas, Geo. J., Lansing, Mich.
 Thompson, W. L., Waterbury, Conn.
 Thompson & Lichtner, 136 Federal St., Boston, Mass.
 Thomson, P. F., 810 Odd Fellow Bldg., Indianapolis, Ind.
 Thomson, Samuel G., Riverside Drive, New York.

Tobey, William L., 74 Washington Ave., Winthrop, Mass.
 Toltz Engineering Co., 1410 Pioneer Bldg., St. Paul, Minn.
 Tomlins, Thomas L., 317 City Bank Bldg., Syracuse, N. Y.
 Toney, Perry S., 1407 Manhattan Bldg., Chicago, Ill.
 Townsend, David, 1716 Spring Garden St., Philadelphia, Pa.
 Viola, Bartholomew, 309 Broadway, New York.
 Wagner, Frank C., 1111 S. 6th St., Terre Haute, Ind.
 Waite, Edward B., Millbury, Mass.
 Waitt, Arthur M., Sharon, Conn.
 Walser, Arthur, Apartado 2468, Havana, Cuba.
 Ward, F. B., 28 Burlington Crescent, Toronto, Ont.
 Wayte, Inc., W. J., 1 Liberty St., New York.
 Weaver, T. A., 678-80 Rockefeller Bldg., Cleveland, O.
 Weinsbank & Fenstermaker, 821 Hume-Mansur Bldg., Indianapolis, Ind.
 Westcott & Mapes, 207 Orange St., New Haven, Conn.
 Westinghouse, Church, Kerr & Co., 37 Wall St., New York.
 Weston, Burt H., Box 702, Dayton, O.
 Whiting, Charles W., 148 State St., Boston, Mass.
 Whyte, John S., Stellarton, Nova Scotia.
 Willette, Charles William, Lock Box 298, Toledo, Ohio.
 Williams, N. N., 3216 Prospect St., Kansas City, Mo.
 Williams, W. G., Oklahoma City, Okla.
 Wilson, Lester G., 2432 Ingleside Place, Cincinnati, O.
 Wood, A. C., Stock Exchange Bldg., Philadelphia, Pa.
 Wood, Arthur J., State College, Pa.
 Wood, Robert, 15 Hawthorne St., Brooklyn, N. Y.
 Wood, Wm. H., 43 Washington St., Media, Pa.
 Yaeger, Harry C., 607 Jackson Blvd., Chicago, Ill.
 Zimmermann, Oliver B., 1438 You St., Washington, D. C.

METAL TREATING

Schwab, Gustav, 525 Market St., San Francisco, Cal.

METALLOGRAPHY (Non-Ferrous)

Bierbaum, Christopher H., 1011 Mutual Life Bldg., Buffalo, N. Y.

METALLURGICAL

Allen, C. H., 1009 17th St., Denver, Colo.
 Colby, Albert L., 447 Lehigh St., So. Bethlehem, Pa.
 Deacon, R. W., 559 Westminster Ave., Elizabeth, N. J.
 Freyn, Brassert & Co., 643 Peoples Gas Bldg., Chicago, Ill.
 Johnson, Jr., J. E., 52 William St., New York.
 McGregor, A. G., Warren, Ariz.
 Moldenke, Dr. Richard, Watchung, N. J.
 Robinson, Louis E., 31 E. 4th St., Cincinnati, O.

MILL ARCHITECTS

Fletcher, E. L., Fletcher-Thompson, Inc., Bridgeport, Conn.
 Taylor, Percy B., Essex Bldg., Newark, N. J.

—Paper

Carey, James L., 208 N. Laramie Ave., Chicago, Ill.

MILL

Makepeace, Charles R., Box 1146, Providence, R. I.
 Brown & Co., Edward C., 207 Essex St., Boston, Mass.

MILLS (See Brass, Paper, Pipe, Pulp, Rolling, Saw, Wire.)

MINES (Management)

Gibson, Arthur, 1022 Haight St., San Francisco, Cal.

MINING

Brown, Herman E., 15 Westchestnut St., Kingston, N. Y.

Branton, D. W., 730 Symes Bldg., Denver, Colo.
 Fleming, Henry Stuart, 1 Brpadway, New York.
 Foster, Rufus J., Scranton, Pa.
 Gibson, Arthur, 1022 Haight St., San Francisco, Cal.

Hoffmann, K. F., 61 Broadway, New York.
 Hollis, H. L., 1025 Peoples Gas Bldg., Chicago, Ill.

Lawrence, Schuyler, Wysox, Bradford Co., Pa.
 Norris, R. V., 520-24 2nd Natl. Bank Bldg., Wilkes-Barre, Pa.

Robbins, Percy A., Timmins, Ontario, Canada.

MINING PLANTS

Behr, H. C., 2 Rector St., New York.

MOTION STUDY

Gilbreth, Inc., Frank B., 77 Brown St., Providence, R. I.

MOTOR TRUCKS

Myers, Cornelius T., 117 W. Fort St., Detroit, Mich.

MUNICIPAL

Hering, Rudolph, 170 Broadway, New York.

N

NATURAL GAS PLANTS

Biddison, P. McDonald, 52 W. Gay St., Columbus, O.

Froehlich, L. C., 1116 House Bldg., Pittsburgh, Pa.

Hope Engineering & Supply Co., Pittsburgh, Pa.
 Peterson & Co., Frank P., Tulsa, Okla.

NAVAL

Norden, Carl L., 375 Fulton St., Room No. 50, New York.

O

OIL REFINERIES

Pink, J. B., P. O. Box 578, Tulsa, Okla.

Peterson & Co., Frank P., Tulsa, Okla.

Williams, W. G., Oklahoma City, Okla.

OPTICAL GLASS MANUFACTURE

Davis, Charles Ethan, 885 West End Ave., New York.

ORDNANCE

Hoddick, F. G., Bethlehem, Pa.

Kaighn, H. E., 2600 Harrison St., Wilmington, Del.

ORDNANCE MATERIAL

Kaighn, H. E., 2600 Harrison St., Wilmington, Del.

ORE DRESSING

Hiller, Joseph L., 21 S. 12th St., Philadelphia, Pa.

ORGANIZATION (See also Factories)

Brinton, Willard C., 7 E. 42nd St., New York.

Butler, J. F., Bayside, L. I., New York.

Cartmell, N. Madison, N. Y. University School of Commerce, New York.

Conard, W. R., Burlington, N. J.

Cooley & Marvin Co., 708-713 Tremont Bldg., Boston, Mass.

Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.

Fleming, Henry Stuart, 1 Broadway, New York.

Franklin, Milton W., 1422-68th Ave., Oak Lane, Philadelphia, Pa.

Hannah, Frederick A., 32 W. 40th St., New York.

Kaighn, H. E., 2600 Harrison St., Wilmington, Del.

Kidd, Walter M., 143 W. 82nd St., New York.

McDonald, Albert, 101 Park Ave., New York.

Polek & Co., J., 2321 Hughes St., Brooklyn, N. Y.

Rantenstrauch, Walter, 117th St. & Broadway, New York.

Slocum, Avram and Slocum, Inc., 30 Pine St., New York.

Thompson, Jr., Inc., Uldric, 120 Broadway, New York.

P

PAPER MILLS

Carey, James L., 208 N. Laramie Ave., Chicago, Ill.

Baton, C. E., Watertown, New York.

Farnham, Bion B., 31-39 Indiana St., Buffalo, N. Y.

Nichols, M. T., 325 E. 44th St., Savannah, Ga.

PATENT EXPERTS

Bierbaum, Christopher H., 1011 Mutual Life Bldg., Buffalo, N. Y.

Gooding, Charles S., 27 School St., Boston, Mass.

Monte, Robert Alva, 149 Commerce St., Newark, N. J.

Penney, Harold D., 9 Murray St., New York.

Sessions, Frank L., Rockefeller Bldg., Cleveland, O.

Wagner, Frank C., 1111 S. 6th St., Terre Haute, Ind.

PATENT LAWYERS

Alexander & Dowell, 900 F St., Washington, D. C.

Barkeley, James T., 1018 Central Bldg., Los Angeles, Cal.

Doble, William A., 190 Sea Cliff Ave., San Francisco, Cal.

Gooding, Charles S., 27 School St., Boston, Mass.

Greenwood, T. T., 40 Court St., Boston, Mass.

Holdridge, C. A., 338 Baldwin Ave., Detroit, Mich.

Lockwood, Marquis H., 2 Rector St., New York.

Marshall, E. W., 160 Broadway, New York.

Ramsey, George, 47th Floor, Woolworth Tower, New York.

Roberts, Odia, 95 Milk St., Boston, Mass.

Schoenborn, William E., McGill Bldg., Washington, D. C.

Schuetz, F., 50 Church St., New York.

Slocum, Avram, and Slocum, Inc., 30 Pine St., New York.

Varney, William W., 1221 Calvert Bldg., Baltimore, Md.

PETROLEUM

Peterson & Co., Frank P., Tulsa, Okla.

Williams, W. G., Oklahoma City, Okla.

PETROLEUM DISTILLING EQUIPMENT

Williams, W. G., Oklahoma City, Okla.

PIPE MILLS (Welded and Seamless)

Ellis, Frank I., 2126 Farmers Bank Bldg., Pittsburgh, Pa.

PLANTS (See Cement, Coal Handling, Dehydrating, Explosives, Factories, Filtration, Foundry, Gasoline, Industrial, Mining, Natural Gas, Potash, Power, Pumping, Steam, Stone Crushing, Textile Mill)

POTASH PLANTS

Cannon-Swenson Co., 53 W. Jackson Blvd., Chicago, Ill.

Meade & Co., Richard K., Law Bldg., Baltimore, Md.

POWDERED FUEL

American Industrial Engrg. Co., Monadnock Block, Chicago, Ill.

POWER

—Generation
 Bierbaum, Christopher H., 1011 Mutual Life Bldg., Buffalo, N. Y.

Case, Willard L., 17 Battery Pl., New York.

Cundall, Powell & Mosher, 80 W. Genesee St., Buffalo, N. Y.

Dreyfus, Edwin D., 1102 Benedum-Trees Bldg., Pittsburgh, Pa.

Garland, C. M., 729 First National Bank Bldg., Chicago, Ill.

Greist, A. O., 233 Broadway, New York.

Krehbiel Co., 1712 Marquette Bldg., Chicago, Ill.

Lucke, Charles E., Columbia University, New York.

Marks, Lionel S., 192 Brattle St., Cambridge, Mass.

Rodgers, H. P., 2099 E. 71st St., Cleveland, O.

Wood, A. C., Stock Exchange Bldg., Philadelphia, Pa.

—Transmission
 Biglow, Lemuel C., 405 Union Ave., Cranford, N. J.

Case, Willard L., 17 Battery Pl., New York.

White Engrg. Corp'n, J. C., 43 Exchange Place, New York.

Pow

POWER PLANTS

Balling & Perrot, N. W. Cor. 17th and Arch Sts., Philadelphia, Pa.
 Boomhower, F. K., Marquette Bldg., Detroit, Mich.
 Breslove, Joseph, 985 Union Arcade Bldg., Pittsburgh, Pa.
 Buckley, Capt. John H., P. O. Box No. 335, Yonkers, N. Y.
 Collins, Hubert E., 132 Boyce Ave., Utica, N. Y.
 Day & Zimmermann, Inc., 611 Chestnut St., Philadelphia, Pa.
 Engel Sr. Construction Co., Godfrey, 30 Church St., New York.
 Franz, Walter G., Union Trust Bldg., Cincinnati, O.
 Haven, H. M. & Crosby, Wm. W., 40 Court St., Boston, Mass.
 Hollis, French & Allen Hubbard, 88 Pearl St., Boston, Mass.
 Kent, Inc., Robert Sayre, 60 Court St., Brooklyn, N. Y.
 Koimer, C. W., Pasadena, Calif.
 Magruder, Wm. T., Ohio State University, Columbus, O.
 Neale, William McC., P. O. Box 825, Greensboro, N. C.
 Reed Jr., Van. A., 1116 House Bldg., Pittsburgh, Pa.
 Rippey, S. Howard, 7012 Greene St., Germantown, Philadelphia, Pa.
 Salisbury, Royal D., 1415 E. Colfax, Denver, Colo.
 States, Louis A., Gastonia, N. C.
 Stevens, John A., 8 Merrimack St., Lowell, Mass.
 Stone & Webster, 147 Milk St., Boston, Mass.
 Taylor, Percy B., Essex Bldg., Newark, N. J.
 Vaughan, John F., 185 Devonshire St., Boston, Mass.
 White Engrg. Corp'n, J. G., 43 Exchange Place, New York.
 Whiting, Charles W., 148 State St., Boston, Mass.
 —Construction
 Norton, Fred E., 656 Main St., Worcester, Mass.
 —Designing
 Acheson, A. R., 852 Ostrom Ave., Syracuse, N. Y.
 Adler, Alphonse A., 85 Livingston St., Brooklyn, N. Y.
 Brown & Co., Edward C., 207 Essex St., Boston, Mass.
 Collins, Hubert E., 132 Boyce Ave., Utica, N. Y.
 Fuel Engineering Co. of New York, 106 E. 19th St., New York.
 McHollan, A., 55 Liberty St., New York.
 Norton, Fred E., 656 Main St., Worcester, Mass.
 —Hydroelectric
 Bogart, A. L., Minneapolis, Minn.
 Doble, William A., 190 Sea Cliff Ave., San Francisco, Cal.
 Finkle, Frederick Cecil, 448-449 I. W. Hellman Bldg., Los Angeles, Cal.
 Harper, John L., Niagara Falls, N. Y.
 Holland, Ackerman & Holland, Lawrence Bldg., Ann Arbor, Mich.
 Larner, Chester W., Widener Bldg., Philadelphia, Pa.
 Main, Charles T., 201 Devonshire St., Boston, Mass.
 Shepard, Geo. R., Niagara Falls, N. Y.
 —Management
 McHollan, A., 55 Liberty St., New York.
 Polakov, Walter N., 31 Nassau St., New York.
 —Operation
 Fuel Engineering Co. of New York, 106 E. 19th St., New York.
 Norton, Fred E., 656 Main St., Worcester, Mass.
 —Piping
 English Co., William T., 308-310 Dover St., Boston, Mass.
PRINTING PRESSES
 Randolph, Frank D., 129 W. Second St., Plainfield, N. J.
PRODUCTION
 Ayres, R. S., 10 Wellman St., Brookline, Mass.
 Butler, J. F., Bayside, L. I., New York.

Pow

Cartmell, N. Madison, N. Y. University School of Commerce, New York.
 Cummings, L. T., cr Miller, Franklin, Basset & Co., 347 Madison Ave., New York.
 Kidder, Walter M., 143 W. 82nd St., New York.
 Lea, E. S., 229 Chestnut Ave., Trenton, N. J.
 McDonald, Albert, 101 Park Ave., New York.
 Rotkowitz, Harry S., 182 E. 72nd St., New York.
 Scovell, Wellington & Co., 110 State St., Boston, Mass.
 Shepard, George H., Industrial Dept., Navy Yard, Norfolk, Va.
 Simeon, Charles J., 677 Cambridge St., Worcester, Mass.
 Thompson, Jr., Inc., Uldric, 120 Broadway, New York.
PRODUCERS, GAS
 Galusha, A. L., Sharon, Mass.
PROJECTILE PRODUCING EQUIPMENT
 Bryant, George F., 58th & Filmore Sts., Chicago, Ill.
PUBLIC UTILITIES (See also Investigations, Valuation)
 Day & Zimmermann, Inc., 611 Chestnut St., Philadelphia, Pa.
 Knowles, Morris, 1200 Jones Bldg., Pittsburgh, Pa.
 Rollins & Co., W. B., 209 Railway Exchange Bldg., Kansas City, Mo.
 Salisbury, Royal D., 1415 E. Colfax, Denver, Colo.
 Stone & Webster, 147 Milk St., Boston, Mass.
 Whiting, Charles W., 148 State St., Boston, Mass.
 White Engrg. Corp'n, J. G., 43 Exchange Place, New York.
 —Management
 Day & Zimmermann, Inc., 611 Chestnut St., Philadelphia, Pa.
 Offutt, M. Webb, 32 W. 40th St., New York.
 —Regulation
 Hoxie, Geo. L., 50 East 41st St., New York.
PUBLICITY
 De Wolfe, E. C., 608 So. Dearborn St., Chicago, Ill.
 Michel & Staff, A. Eugene, 116 Nassau St., New York.
PULP MILLS
 Cannon-Swenson Co., 53 W. Jackson Blvd., Chicago, Ill.
 Ryther, Geo. D., Carthage, N. Y.
PUMPING PLANTS
 Doble, William A., 190 Sea Cliff Ave., San Francisco, Cal.
PURCHASING
 Cartmell, N. Madison, N. Y. University School of Commerce, New York.

R

RAILROAD STATIONS

Place, Clyde R., Grand Central Terminal, New York.
RAILWAY EQUIPMENT
 Ostrander, A. E., 165 Broadway, New York.
REFRACTORY MATERIALS
 Pike, Robt. D., 74 New Montgomery St., San Francisco, Cal.
REFRIGERATION
 Bertsch, J. C., Monongahela Bank Bldg., Pittsburgh, Pa.
 Fletcher, E. L., Fletcher-Thompson, Inc., Bridgeport, Conn.
 Goetz, Victor J., 675 W. 12th St., Philadelphia, Pa.
 Haven, H. M. & Crosby, Wm. W., 40 Court St., Boston, Mass.
 Schloss, Newton L., 25 W. 32nd St., New York.
 —Fish
 Irwin, Oliver C., 291 Broadway, New York.
 —Marine
 Irwin, Oliver C., 291 Broadway, New York.

RESEARCH

Abbot, Jr., W. G., Wilton, N. H.
Gibson, Geo. H., Tribune Bldg., New York.
Greenwood, T. T., 40 Court St., Boston, Mass.
Monte, Robert Alva, 149 Commerce St., Newark, N. J.

—Gas and Oil Engines

Illmer, Louis, 22 Paul St., Newton Centre, Mass.

RIVER AND HARBOR IMPROVEMENTS

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

ROLLING MILLS

Ellis, Frank I., 2126 Farmers Bank Bldg., Pittsburgh, Pa.

RUSTPROOFING

Wunsch & Washburn, 207 Centre St., New York.

S

SAFETY

Bagg, S. F., 251-253 River St., Troy, New York.
Banash, J. I., 207 E. Ohio St., Chicago, Ill.
Mowery, H. Weaver, 50 Church St., New York.
Spence, Peter C., 70 W. 71st St., New York.

SALT WORKS

Cannon-Swenson Co., 53 W. Jackson Blvd., Chicago, Ill.

SANITARY

Ballinger & Perrot, N. W. Cor. 17th and Arch Sts., Philadelphia, Pa.

Earl, Ralph, 131 Robinson St., Pittsburgh, Pa.
Franz, Walter G., Union Trust Bldg., Cincinnati, O.

Landreth, Olin H., Union College, Schenectady, N. Y.

SAW MILLS

Hill, Anthony S., 90 West St., New York.

SEWERAGE DISPOSAL

Salisbury, Royal D., 1415 E. Colfax, Denver, Colo.

SEWERS

Salisbury, Royal D., 1415 E. Colfax, Denver, Colo.

SHIPBUILDING OVERHEAD SYSTEMS

Hays, Lewis T., 1054-64 Fourth Ave., S., Seattle, Wash.

SHOP MANAGEMENT

Harris, Harry E., P. O. Box 852, Bridgeport, Conn.

SPRINKLER EQUIPMENT

English Co., William T., 308-310 Dover St., Boston, Mass.

STANDARDIZATION

Buckley, Capt. John H., P. O. Box No. 335, Yonkers, N. Y.

STEAM HAMMERS

Bell, David, 911 Lafayette Ave., Buffalo, N. Y.

STEAM PLANTS

Farnham, Bion B., 31-39 Indiana St., Buffalo, N. Y.

Main, Charles T., 201 Devonshire St., Boston, Mass.

Perkins, George H., Lowell, Mass.
Rodgers, H. P., 2099 E. 71st St., Cleveland, O.

Stevens, John A., 8 Merrimack St., Lowell, Mass.
Stumpf Una-Flow Engine Co., Inc., 401 S. A. & K. Bldg., Syracuse, N. Y.

STONE CRUSHING PLANTS

Breslove, Joseph, 985 Union Arcade, Pittsburgh, Pa.

STORESKEEPING

Cartmell, N. Madison, N. Y. University School of Commerce, New York.

STRUCTURAL

Curry, John R., 608 City Trust Bldg., Indianapolis, Ind.

Knopf, George, 6038 Locust St., Philadelphia, Pa.
Swain, Geo. T., Mass. Inst. Technology, Boston, Mass.

Westcott & Mapes, 207 Orange St., New Haven, Conn.

—Designing

Hollis, French & Allen Hubbard, 88 Pearl St., Boston, Mass.

SUGAR FACTORIES

Beranger, Jos. P., 129 Front St., New York.
Cannon-Swenson Co., 53 W. Jackson Blvd., Chicago, Ill.

Dyer Co., 2031 Euclid Ave., Cleveland, O.
Honolulu Iron Works Co., 233 Broadway, New York.

Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.

Murray, Warren E., San Francisco, Cal.
Saldana, Edwardo E., P. O. Box 906, San Juan, Porto Rico.

Vickess, Samuel, 129 Front St., New York.

—Beet

Engel Sr. Construction Co., Godfrey, 30 Church St., New York.

—Cane

Engel Sr. Construction Co., Godfrey, 30 Church St., New York.

Kent, Inc., Robert Sayre, 50 Court St., Brooklyn, N. Y.

SUPERVISION

Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

T

TESTING

Lloyd, Robert McAllister, 347 Madison Ave., New York.

—Gas

Fink, J. B., P. O. Box 578, Tulsa, Okla.

—Hydraulic Turbine

Allen, Charles M., Boynton St., Worcester, Mass.

—Laboratory

Fermier, E. J., College Station, Tex.
Gebhardt, G. F., Armour Inst. of Technology, Chicago, Ill.

Le Page, Clifford B., Stevens Institute of Technology, Hoboken, N. J.

—Materials

Conard, W. R., Burlington, N. J.

—Steam Plants

Fermier, E. J., College Station, Tex.

TEXTILE MILL PLANTS

Perkins, George H., Lowell, Mass.

TEXTILE MILLS

Hartshorne, William Davis, 40 Pleasant St., Methuen, Mass.

THERMAL APPARATUS

Lucke, Charles E., Columbia University, New York.

TIME FUSE MANUFACTURE

Davis, Charles Ethan, 885 West End Ave., New York.

TOOL DESIGNING

Bentley & Holmgren, 406 Court Exchange Bldg., Bridgeport, Conn.

Diamant, Sidney, 164 Emmett St., Newark, N. J.
Harris, Harry E., P. O. Box 852, Bridgeport, Conn.

Monte, Robert Alva, 149 Commerce St., Newark, N. J.

TRACTORS

Myers, Cornelius T., 117 W. Fort St., Detroit, Mich.

TRAMWAYS (Wire Rope)

Hays, Lewis T., 1054-64 Fourth Ave., S., Seattle, Wash.

TRANSPORTATION

Swain, Geo. T., Mass. Inst. Technology, Boston, Mass.

V

VALUATION (See also Appraisals)

Harris, Harry E., P. O. Box 852, Bridgeport, Conn.

Val

VALUATION (Continued)

Hoxie, Geo. L., 50 East 41st St., New York.
 Landreth, Olin H., Union College, Schenectady,
 N. Y.
 Scott, Arthur C., 601 Praetorian Bldg., Dallas,
 Texas.
 Swain, Geo. T., Mass. Inst. Technology, Boston,
 Mass.
 —Industrial
 Case, Willard L., 17 Battery Pl., New York.
 —Public Utilities
 Collins, Francis W., 50 Church St., New York.
VENTILATING (See also Heating and Ventilating)
 Boomhower, F. K., Marquette Bldg., Detroit,
 Mich.
 Franz, Walter G., Union Trust Bldg., Cincinnati,
 O.
 Spence, Peter C., 70 W. 71st St., New York.

W

WASTE HEAT

American Industrial Engrg. Co., Monadnock
 Block, Chicago, Ill.

WASTE UTILIZATION

Wayte, Inc., W. J., 1 Liberty St., New York.

WATER PURIFICATION

Rice, Cyrus Wm., 63rd & Woodland Ave., Philadelphia, Pa.

WATER SUPPLY SYSTEMS

Wood, A. C., Stock Exchange Bldg., Philadelphia, Pa.

WATER WORKS

Holland, Ackerman & Holland, Lawrence Bldg.,
 Ann Arbor, Mich.
 Salisbury, Royal D., 1415 E. Colfax, Denver,
 Colo.

WIRE MILLS

American Industrial Engrg. Co., Monadnock
 Block, Chicago, Ill.

WOODWORKING MACHINERY

Hill, Anthony S., 90 West St., New York.
 Neale, William McC., P. O. Box 825, Greensboro,
 N. C.

WORK ROUTING

Harris, Harry E., P. O. Box 852, Bridgeport,
 Conn.

JAN 8 - 1934

